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Transportation Measures for the Improvement of Connecticut Air Quality

Prepared for Connecticut Department of Transportation

November, 1980

Cambridge Systematics, Inc.

TRANSPORTATION MEASURES FOR THE IMPROVEMENT OF CONNECTICUT AIR QUALITY

PHASE I - Draft Report

Prepared for

Connecticut Department of Transportation
Bureau of Planning and Research
Office of Environmental Planning
Wethersfield, Connecticut 06109

Prepared by

Cambridge Systematics, Inc.
238 Main Street
Cambridge, Massachusetts 02142

With Subcontractor Assistance from

Multisystems, Inc.

and

Wagner-McGee Associates, Inc.

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Preface

The preparation of this report has been financed in part through a grant from the US Environmental Protection Agency under Section 175 of the Clean Air Act and administered by the US Department of Transportation; and in part through a grant from the US Department of Transportation, Urban Mass Transportation Administration and administered by the Tri-State Regional Planning Commission. The opinions, findings and conclusions expressed in this publication, though, do not necessarily reflect the official views of the US Environmental Protection Agency; the US Department of Transportation, Urban Mass Transportation Administration; or the Tri-State Regional Planning Commission.

I. Available Transportation Actions

The State of Connecticut, like many other parts of the country, needs to reduce the amount of pollution in the air. Controls on factories and power plants and emissions controls on new cars help, but are not enough to assure clean air. Additional steps to reduce pollution caused by automobiles are required by the 1977 Clean Air Act Amendments and by implementing guidelines jointly issued by the US Environmental Protection Agency (EPA) and the US Department of Transportation. Importantly, fuel savings will constitute a large related benefit of these additional transportation actions to be taken.

This report provides a summary of the potential of 65 separate transportation measures that can be implemented on a statewide basis within Connecticut to contribute to reduced vehicular emissions (Table 1).[1] Some of these, such as expansion of the existing bus transit fleet or introduction of additional rail passenger services, would require both reasonably large capital expenditures and a long lead time; other strategies are oriented to a much shorter time horizon and can be implemented both quickly and with a relatively small fiscal expenditure. The target objective is a 10 percent

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[1] Documentation of the analyses upon which these impact summaries are based is available in the form of technical memoranda corresponding to each of the 14 policy areas identified in Table 1. In addition, a 15th memorandum discusses potential impacts of these transportation measures on Connecticut's economy and competitive position.

TABLE 1: Transportation Policy Areas and Measures Analyzed

Policy	Measures
1. Transit Service Improvements	Expansion of bus transit fleet by 50, 100 and 500 percent Expansion of off-peak service frequencies and service hours for existing fleets Introduction of additional public transportation schedule coordination (modal interface improvements)
2. Transit Fare	Reduction in transit fares Differential fare policy for peak and off-peak time periods Increased promotion and financial discount for pre-paid monthly transit pass programs
3. Buspooling and School Bus Use	Buspooling and financial assistance for starting costs Use of school buses during summer peak pollution periods.
4. Rail Passenger Improvements	Rail transit construction in lieu of major highways scheduled for construction after 1981
5. Regulation	Mandatory employee/vehicle ratios Elimination of drive-in windows Limitation on number of motor vehicle registrations Limitation on number of driver's licenses One-day-a-week driving ban Gasoline rationing Weekend ban on non-diesel gasoline sales
6. Pricing	Increased fuel taxes Increased auto ownership fees State gasoline tax rebate for vanpool journey to work Corporate exemption of state sales tax on vans purchased for vanpooling Corporate exemption of local property tax on vans purchased for vanpooling State subsidized vanpool liability insurance Carpool and vanpool cost subsidies Carpool parking subsidies Tax incentives for employer transportation programs
7. High Occupancy Vehicle Priority Lanes	I-95 East of New Haven I-95 West of New Haven I-91 New Haven I-91 South of Hartford I-91 North of Hartford I-84 East of Hartford I-84 West of Hartford Route 7, I-84 Danbury I-84 East and West of Waterbury Route 7 Norwalk Route 25 Bridgeport
8. Parking	Increase number of free commuter carpool parking lots, vanpool lots, express bus lots and rail station lots.

TABLE 1: (continued)

Policy	Measures
9. Ridesharing	Carpooling: State employees carpooling program Carpool matching and consultation services to private employers Areawide carpool matching Deregulation of carpools Vanpooling: Vanpool assistance to private employers in urbanized areas Vanpool assistance to private employers in non-urbanized areas State employees vanpooling program--statewide Vanpool brokerage Deregulation of vanpools
10. Bicycle Improvements	Facility Improvements Education Registration and Licensing Enforcement
11. Goods Movement	Intercity Trucking: Increased size and weight limits Highway cost allocation Truck rate and service deregulation Truck emission standards Intercity Rail: Light density line abandonment Rail intermodal transportation Rail rate deregulation Urban Goods Movement: Consolidation of terminals and operations
12. Marketing, Promotion and Public Information	Work trip commutation Transit and Ridesharing Air Quality and Energy
13. Areawide Traffic Control System Improvements	Coordination of Signals Optimization of signal timing cycles, splits, and offsets Computerized Traffic Control
14. Retail Sales Operations	Two-day-a-week retail store closing

reduction in the state's 1976 hydrocarbon emission levels. To achieve this target, it is unlikely that any one single measure will be sufficient; rather a multi-year program or package of actions will have to be implemented combining the benefits of several individual measures.

The potential impacts of these transportation actions are provided in Chapter IV in the form of one-page summary sheets. To provide a basis for evaluating these findings, background air quality data and legislative requirements are summarized in Chapter II. The overall project description and time schedule, of which this constitutes the first of four phases, is described in Chapter III. Preliminary recommendations for subsequent phases are contained in Chapter V.

II. Contribution of the Automobile to Air Quality

Basic Air Pollution Facts

Air pollution is composed of several contaminants. The principal pollutants are sulfur oxides, suspended particulates, carbon monoxide, hydrocarbons, nitrogen oxides, and photochemical oxidants, the primary component of which is ozone. Transportation vehicles are a major source of emissions of carbon monoxide, hydrocarbons, and nitrogen oxides; oxidants--often known as smog--are not emitted directly, but form in the presence of sunlight from a series of chemical reactions between hydrocarbons and nitrogen oxides. Transportation sources also contribute to particulate pollution, for example, by emissions or loss of particles such as rubber from tires. Sulfur oxides, on the other hand, are primarily emitted by "stationary sources"--factories, power plants, and heating units, for example--which also produce substantial amounts of the other pollutants.

In transportation-air quality planning, the pollutants of principal concern are ozone (and its precursors, hydrocarbons and nitrogen oxides) and carbon monoxide (Table 2). The national ambient air quality standard for ozone is a one-hour average of .12 parts per million (ppm) not to be exceeded more than once a year. For carbon monoxide, the standard is set at 35 ppm one-hour average and a 9 ppm eight-hour average, neither to be exceeded more than once per year. These standards were established by the US Environment Protection Agency to adequately protect public health and are based on the latest available scientific information.

TABLE 2: Federal Standards for CO and Ozone

CO:	1 hour average:	35 ppm
	8 hour average:	9 ppm
O_3 (Photochemical oxidants):		
	1 hour average:	.12 ppm

These averages may only be exceeded once a year.

Carbon Monoxide

Carbon monoxide (CO), a colorless, odorless gas, is a principal component of auto exhausts which results when insufficient oxygen is present during combustion so that fuel is not completely burned. CO emissions can be reduced by increasing the air/fuel ratio, but because the air/fuel mixture cannot be evenly distributed within the combustion chamber, some CO still will be produced. In contrast, when the combustion process is more completely controlled, as in a large boiler, CO production can be reduced to an insignificant level. Thus, automobiles are by far the primary source of CO. Further, CO emissions are worse at lower speeds and in stop-and-start driving.

Hydrocarbons, Nitrogen Oxides, and Ozone

Hydrocarbons (HC) originate in vehicular exhausts, in other vehicular emissions such as fuel tank evaporation, and from stationary sources--especially petrochemical facilities. Most of the auto-related emissions are a by-product of combustion in the engine. Incomplete combustion produces partially oxidized hydrocarbons, and as with CO, non-uniformities within the combustion chamber make it difficult to eliminate this problem entirely. There are other, relatively minor, sources of automotive hydrocarbons, including gases escaping from the crankcase (primarily in pre-1968 vehicles), gasoline evaporating through the air intake each time a warmed up vehicle is turned off and the normal, continual evaporation of gases from the fuel tank.

In contrast with CO and HC, nitrogen oxides (NO_x) are by-products of efficient and well-regulated combustion processes, and for this reason are more common in stationary source emissions than either of

the other two. This happens because NO_x is formed at the high temperatures which occur when combustion is complete. As a result, many of the measures which tend to reduce HC and CO vehicular emissions have the opposive effect on NO_x.

Nitrogen oxides and hydrocarbons react in the atmosphere to form photochemical smog, which is a descriptive term for a mixture of ozone (O_3) and a variety of other compounds, often including nitric oxide (NO), nitrogen oxide (NO_2), reactive hydrocarbons, and oxidized hydrocarbons.

Ozone is the oxidant found in the largest amounts and is easiest to measure; nearly all of the health studies of oxidants are based on ozone's effects. For these reasons, the national ambient air quality standard governing oxidants is designated as an ozone standard.

Ozone formation not only requires the presence of sunlight, but is speeded when sunshine is very bright. Other weather conditions also are important factors in the occurrence and severity of ozone formation and the length of an ozone episode, including the presence or absence of strong winds (which can bring clean air into a region and disperse contaminants), local wind conditions (which can shift air pollutants back and forth across the region and build up heavy concentrations), and the frequency of inversions (which can trap pollutants for several days). Thus, ozone is a regional problem which is not necessarily worst at the time or place where heavy emissions occur. Hydrocarbons and NO_x emitted by cars in one section of an urbanized area may be transported by winds and may produce ozone in other sections or even across a whole region.

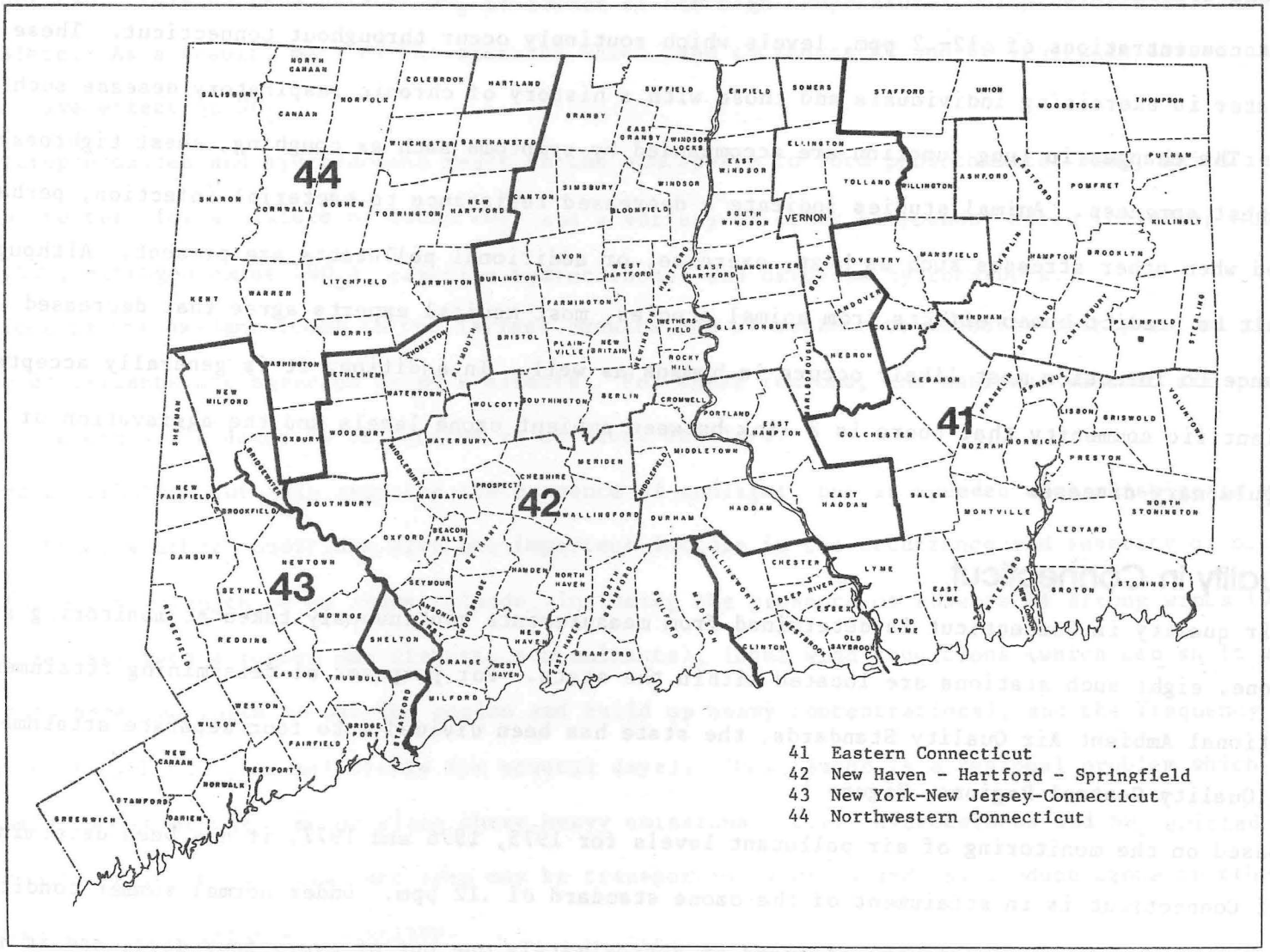
Ozone irritates the mucous linings and lung tissue and decreases the efficiency of the respiratory tract at concentrations of .12-.2 ppm, levels which routinely occur throughout Connecticut. These effects are greater in exercising individuals and those with a history of chronic respiratory desease such as asthma. The changes in lung function are accompanied by symptoms such as coughing, chest tightness, and lower chest soreness. Animal studies indicate a decreased resistance to bacterial infection, perhaps worsened when other stresses such as heat, exercise, or additional pollutants are present. Although it is difficult to predict human effects from animal studies, most medical experts agree that decreased resistance to infection most likely occurs in humans as well. In addition, it is generally accepted in the scientific community that there is a link between ambient ozone levels and the aggravation of cardiopulmonary disease.

Air Quality in Connecticut

Air quality in Connecticut is determined from measurements continuously taken at monitoring sites. For ozone, eight such stations are located within the state. For purposes of determining attainment of the National Ambient Air Quality Standards, the state has been divided into four separate attainment areas or Air Quality Control Regions, Figure 1.

Based on the monitoring of air pollutant levels for 1975, 1976 and 1977, it has been determined that none of Connecticut is in attainment of the ozone standard of .12 ppm. Under normal summer conditions, the state can expect to violate the standard on approximately one out of every four days, and it is not

FIGURE 1: Connecticut Air Quality Control Regions



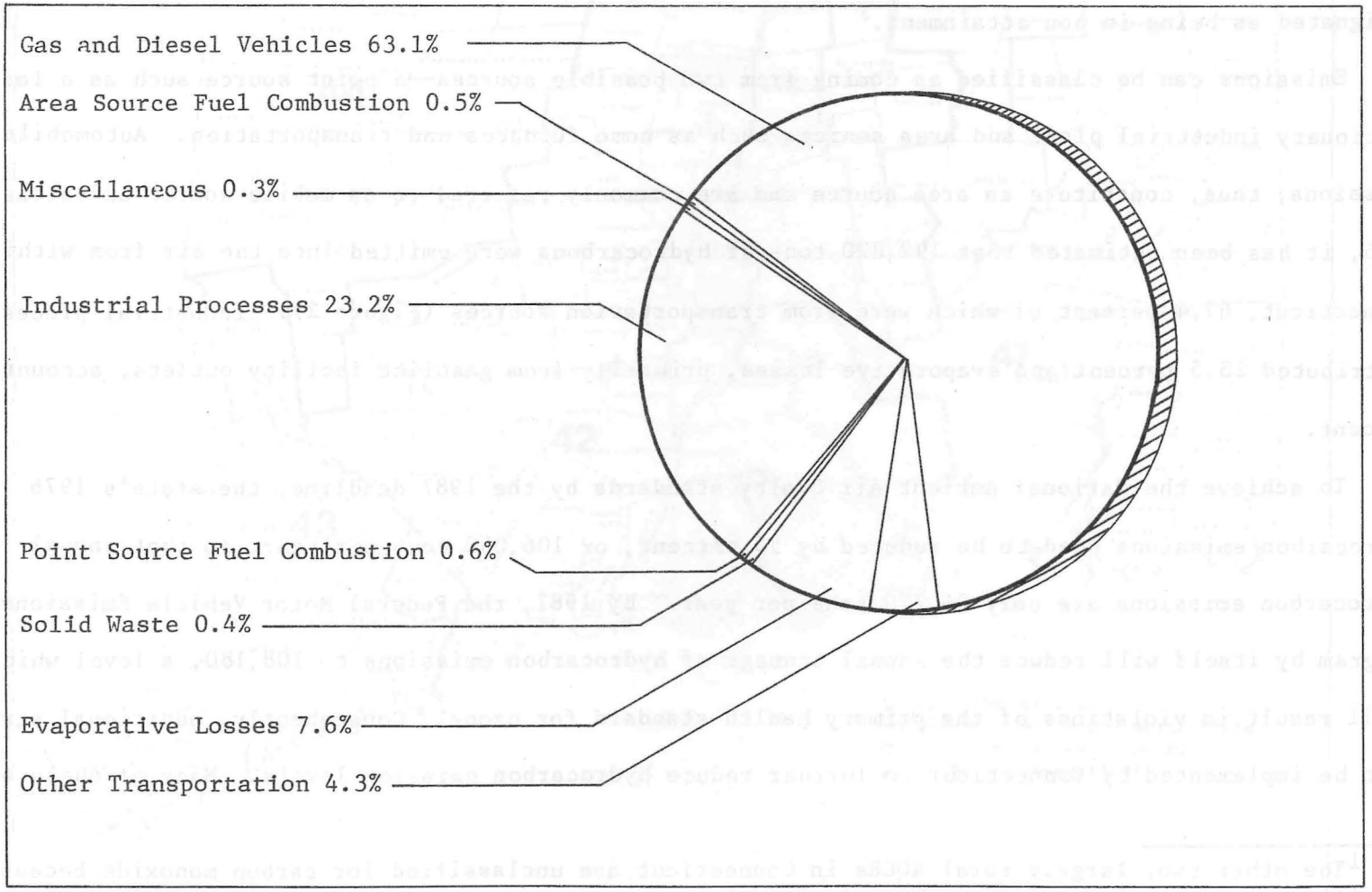
unusual for ozone levels in excess of twice the standard to be observed. For carbon monoxide, the New Haven-Hartford-Springfield corridor (AQCR 42) and the southwest portion of the state (AQCR 43) have been designated as being in non-attainment.[1]

Emissions can be classified as coming from two possible sources--a point source such as a large stationary industrial plant and area sources such as home furnaces and transportation. Automobile emissions, thus, constitute an area source and are commonly referred to as mobile source emissions. In 1976, it has been estimated that 192,820 tons of hydrocarbons were emitted into the air from within Connecticut, 67.4 percent of which were from transportation sources (Figure 2). Industrial processes contributed 23.5 percent and evaporative losses, primarily from gasoline facility outlets, account for 7.3 percent.

To achieve the National Ambient Air Qualty standards by the 1987 deadline, the state's 1976 hydrocarbon emissions need to be reduced by 55 percent, or 106,050 tons per year, so that annual hydrocarbon emissions are only 86,770 tons per year. By 1987, the Federal Motor Vehicle Emissions Control Program by itself will reduce the annual tonnage of hydrocarbon emissions to 108,180, a level which will still result in violations of the primary health standard for ozone. Consequently, additional strategies must be implemented by Connecticut to further reduce hydrocarbon emission levels. Many of these also can

[1]The other two, largely rural AQCRs in Connecticut are unclassified for carbon monoxide because of insufficient monitoring data to make a designation.

FIGURE 2: 1976 Statewide Distribution of Hydrocarbon Emissions



Source: 1979 Connecticut State Implementation Plan

effectively reduce carbon monoxide, lead, nitrogen dioxide and particulate emissions, as well as contributing to energy conservation. Within the transportation sector, one major initiative is the automobile inspection and maintenance program currently being implemented, and this is expected to reduce 1987 hydrocarbon annual emission levels by 9,320 tons--an amount which is still not sufficient to achieve the standard.

A second major transportation initiative involves the implementation of various transportation projects by both the State and its towns and cities which are directed towards achieving an additional 20 percent reduction in annual hydrocarbon emissions. Half of this goal, or 10 percent, is to be achieved through projects programmed by the Connecticut Department of Transportation and half by the state's Regional Planning Agencies. In addition, the Department of Environmental Protection is investigating various motor vehicle controls, such as vapor recovery and light duty vehicle retrofit devices, which are directed at achieving the goal of another 10 percent reduction in annual hydrocarbon emissions. The result of these efforts, together with the automobile inspection and maintenance program and the Federal Motor Vehicle Emissions Control Program, would be achievement of the necessary emissions reductions so that total 1987 hydrocarbon emissions would be less than 86,770 tons.

Requirements for Transportation-Air Quality Planning

The discussion of Connecticut's air quality problems referenced a Federal ozone standard of .12 ppm (to be exceeded only once a year) and a 1987 attainment schedule. These are only two of the important clean air requirements set forth in Federal legislation and related guidance documents with which

Connecticut must comply. A basic knowledge of these requirements is useful both in evaluating alternative transportation measures and in understanding the process with which they are being developed.

Over the past decade, in response to growing concern about the effects of air pollution, Congress has enacted legislation designed to provide for healthful air quality throughout the nation. In 1970, the landmark Clean Air Act Amendments called for the establishment of national ambient air quality standards and mandated emissions standards for new cars. The 1970 law also required the development of State Implementation Plans (SIPs) for bringing air quality up to acceptable levels through a combination of controls on emissions from stationary sources, such as factories and power plants, and transportation controls designed to reduce total auto emissions.

The 1970 Amendments set forth the ambitious goal of achieving clean air no later than 1975. For a variety of reasons, however, the metropolitan areas facing the most serious air pollution problems found it impossible to meet that deadline. One of the more difficult tasks, it was found, was developing the transportation component of the SIP, the "Transportation Control Plan" (TCP).

Difficulties in developing acceptable transportation measures to improve air quality were exacerbated by delays granted to auto manufacturers in meeting the new car standards. The delays meant that the air quality improvements which had been expected from new cars had to be made up by the stationary source or transportation controls. But neither program had the ability to assume even more responsibility for clean air. Further reductions from stationary sources were limited both by the availability of control technology and by the fear that stringent controls could lead to economic disruption. And although most

transportation agencies already were implementing certain measures to improve air quality, it had become clear that a continuing process for transportation-air quality planning was necessary. The overall result was that most large urban areas could not meet the 1975 attainment deadline.

Congress responded to this situation with the passage of the 1977 Clean Air Act Amendments (Table 3). These Amendments not only extended certain deadlines for attainment of the national ambient air quality standards, but made sweeping changes to the procedures through which transportation-based air quality improvements measures are to be developed and implemented. Many of the new provisions were designed to avoid problems which occurred in transportation control planning under the 1970 Amendments. Other provisions clarify the responsibilities of the US Department of Transportation and other agencies in support of transportation actions to reduce air pollution.

The 1977 Clean Air Act Amendments establish federal, state, and local requirements aimed at attainment of the national ambient air quality health standards by December 31, 1982. However, the Amendments provide for extensions up to the end of 1987 for attainment of the standards for carbon monoxide (CO) and photochemical oxidants (or ozone) in cases such as Connecticut where the 1982 deadline cannot be met despite implementation of all reasonable measures.

The 1977 Amendments also place emphasis on the establishment of a participatory, continuing process for air quality planning and decisions. They call for state, regional, and local officials in nonattainment areas to jointly determine which planning, implementation and enforcement responsibilities each level of government will assume.

TABLE 3: Highlights of the Clean Air Act Amendments of 1977

- national air quality standards must be met by December 31, 1982, except that extensions to December 31, 1987 are available for CO and ozone attainment
- vehicle inspection and maintenance is required in areas not attaining the CO or ozone standard by 1982
- areas which cannot meet the 1982 deadline for CO or ozone must develop and implement additional transportation-air quality measures
- transportation-air quality alternatives are to be developed through a participatory process involving regional, state, and local agencies, elected officials, interest groups, and the public
- analysis of alternatives must consider air quality, transportation, energy, and other social, economic and environmental effects
- nonattainment areas must show reasonable progress in developing and implementing transportation-air quality projects
- federal agencies must give priority to projects which improve air quality and cannot support or approve projects which do not conform to air quality
- federal grants are available to help fund the transportation-air quality planning process

A State Implementation Plan (SIP) remains the foundation for transportation-related air quality attainment. Areas were required to submit revised SIPs by January 1, 1979, either showing attainment of the carbon monoxide and ozone standards by 1982 or demonstrating to the satisfaction of EPA that such attainment is not possible despite the implementation of all available stationary source and transportation measures. In the latter case, a new plan must be submitted by July 1, 1982, demonstrating attainment as expeditiously as practicable but not later than 1987. The analysis results reported here will be used in the development of this 1982 SIP revision. These and other plan provisions must be adopted or promulgated with reasonable public involvement and must include not only measures to assure attainment and maintenance of the standards, but also schedules and timetables for compliance and other evidence of the necessary commitments to implement and enforce the plan provisions.

In areas unable to meet the standards for CO and ozone by 1982, a program for vehicle inspection and maintenance (I/M) is required. The I/M program is intended to assure that vehicle pollution control devices are in operation and working effectively and that the vehicles are tuned to minimize pollution. In addition, such areas must demonstrate a commitment by responsible government officials to establish, expand, and improve public transportation to meet basic transportation needs as expeditiously as practicable, using available grants and funds to do so.

The Amendments provide for grants to designated agencies for establishing a transportation-air quality planning process and for developing and evaluating transportation measures which could improve air quality. On the other hand, sanctions are authorized against areas which fail to make reasonable efforts

to reduce air pollution. If an area has not submitted or made reasonable efforts toward submitting a SIP, EPA cannot approve projects or award grants authorized by the Amendments, and DOT cannot approve projects or grants other than for safety, mass transit, or transportation improvement projects related to air quality improvement and maintenance in that area. Another significant provision requires all agencies of the federal government having authority to conduct or support any program with air quality related-transportation consequences to give priority to the implementation of air quality plan provisions, and specifies that the requirement extends to transit, highway, housing, land use planning, and urban development programs. Further, the Amendments stipulate that no federal agency shall engage in, support, financially assist, license, or approve any action which does not conform to an air quality plan, nor shall any metropolitan planning organization approve a nonconforming plan, program, or project.

The 1977 Amendments also call for guidelines for transportation-air quality planning, and such guidelines were jointly issued by the US Environmental Protection Agency and the US Department of Transportation on June 14, 1978. The guidelines describe an acceptable planning process for the transportation portions of a State Implementation Plan and apply to all agencies, including the Connecticut Department of Transportation, which have planning or implementation responsibilities for transportation measures designed to improve air quality. Major provisions of the guidelines call for the integration of transportation-air quality planning into the ongoing transportation planning process specified in U.S Department of Transportation regulations, and performance of a thorough "alternatives analysis" of a wide range of transportation strategies (Table 4).

TABLE 4: Transportation Measures Deemed Reasonably Available in the Clean Air Act of 1977

- Inspection/maintenance
- Improved public transit
- Exclusive bus and carpool lanes
- Areawide carpool programs
- Private car restrictions
- Long range transit improvements
- On-street parking controls
- Park and ride and fringe parking lots
- Pedestrian malls
- Employer programs to encourage car and vanpooling, mass transit
- Bicycling and walking
- Bicycle lanes and storage facilities
- Staggered work hours
- Road pricing to discourage single occupancy auto trips
- Controls on extended vehicle idling
- Traffic flow improvements
- Alternative fuels or engines and other fleet vehicle controls
- Other than light duty vehicle retrofit
- Extreme cold start emission reduction programs

III. Statewide Analysis of Transportation-Air Quality Measures

Overview of Work Program

The Connecticut Department of Transportation is responsible for the analysis of those transportation-air quality measures which are statewide in orientation and where a state-level agency would have lead responsibility if a decision is made to proceed with implementation. The analyses of individual measures and integrated packages is being undertaken in a multi-phased work program that is designed to use successively more detailed analysis techniques over the course of the study. The first phase, the results of which are currently being reported, constitutes a "first pass" sketch planning analysis. Those measures judged to be most promising will continue to be analyzed during the second phase and assembled into candidate program packages. During this second phase, alternative strategies will be specified in greater detail and estimates of travel, emissions, energy and other impacts will be developed in more detail than was possible during Phase I.

Certain measures found to be ineffective, or having a very low assessment of feasibility, during the first phase analysis may receive no additional consideration during subsequent phases. No measures, however, will be totally eliminated from consideration. Marginally effective or feasible measures will be considered for compatibility with the packages which evolve.

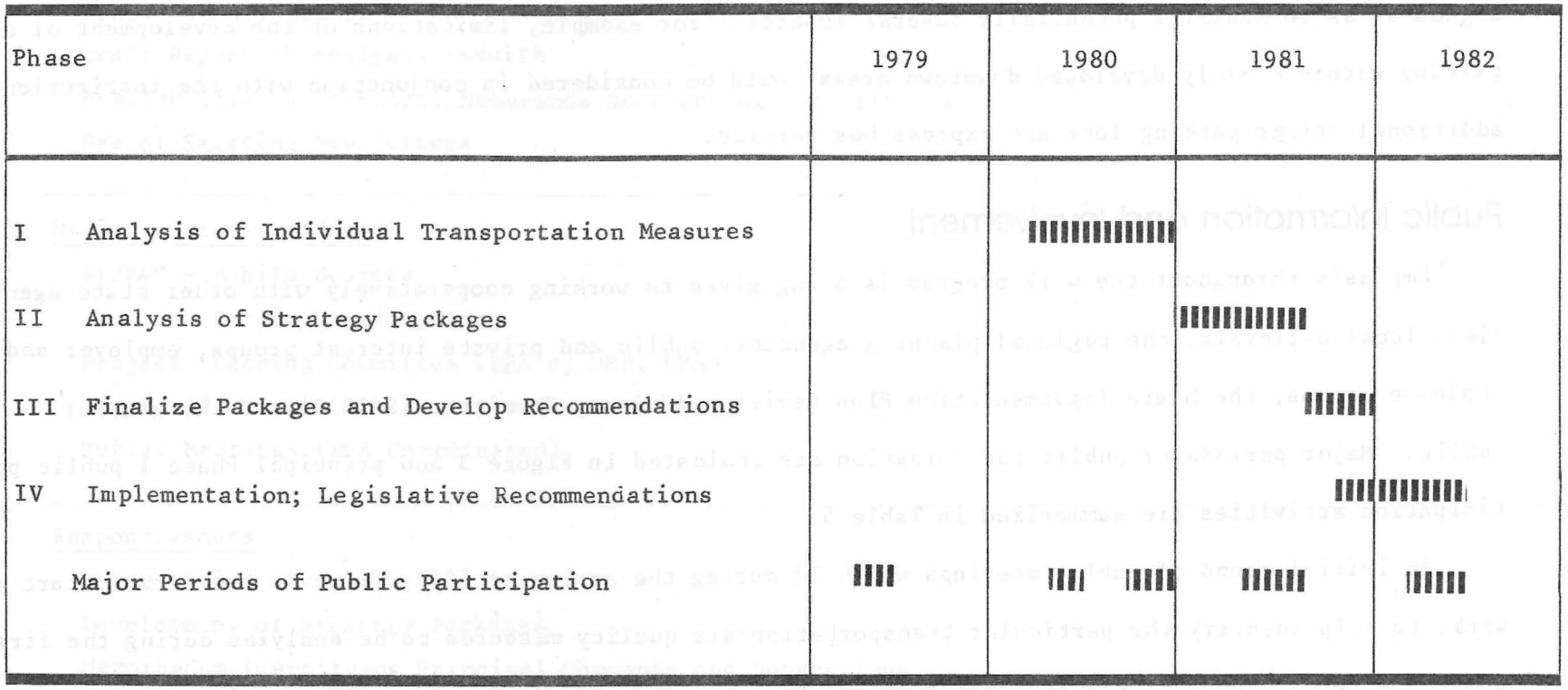
Phase I of the statewide analysis is scheduled to be completed during December, 1980 and the more detailed second phase analyses are anticipated to require the first eight months of 1981 (Figure 3). At the completion of this second phase--roughly September through November, 1981--final recommendations will be developed and any remaining analyses will be completed. The July 1, 1982 submission of the State Implementation Plan is to include evidence of commitments to implement and enforce the plan provisions. For most transportation measures, this evidence is to be in the form of signed state legislation. Phase IV of the work program, occuring during early 1982, then constitutes an implementation phase in which any necessary supporting legislation will be developed and submitted for consideration to the 1982 session of the Connecticut State Legislature.

In parallel with the analysis of potential statewide transportation-air quality measures, each of the State's designated regional planning agencies is investigating corresponding strategies that can be implemented by either local or regional agencies. These regional analyses are proceeding with roughly the same schedule as the statewide study, with an initial screening phase being completed during the fall of 1980.

The integrated strategy packages to be analyzed during the second phase of the study will be jointly developed by the Connecticut DOT and the regional planning agencies, and will consist of combinations of individual strategies felt to be beneficial at the statewide and regional levels.

Packages will be specified so as to suit the specific needs of geographic areas. For example, in areas with good existing transit service, strategies might focus on shifting travel demand from the

FIGURE 3: Time Schedule — Statewide Analysis of Transportation Air Quality Measures



private auto to bus. Alternatively, in areas with little or no transit, the emphasis might be on increasing current levels of ridesharing, or even on reducing the need for person travel. Packages will be designed so as to minimize potentially adverse impacts. For example, limitations on the development of new parking within densely developed downtown areas could be considered in conjunction with the institution of additional fringe parking lots and express bus service.

Public Information and Involvement

Emphasis throughout the work program is being given to working cooperatively with other state agencies, local officials, the regional planning agencies, public and private interest groups, employer and employee groups, the State Implementation Plan Revision Advisory Committee (SIPRAC) and the general public. Major periods of public participation are indicated in Figure 3 and principal Phase I public participation activities are summarized in Table 5.

An initial round of public meetings was held during the spring of 1979, prior to the formal start of work, to help identify the particular transportation-air quality measures to be analyzed during the first phase. A second round of six regional meetings will be conducted during late 1980 to discuss the results of the screening round of technical analyses and to seek input as to the particular set of measures to carry forward into Phase II. A third round of meetings then will be held at the completion of Phase II regarding the choice of those packages of measures to recommend for implementation.

TABLE 5: Major Phase I Public Participation Activities

Information Distribution (Outreach)
Draft Summary Report
Draft Report on Analysis Results
Availability of Technical Memoranda Documenting Analysis Results
Use of Existing Newsletters
Meetings (Interaction)
SIPRAC - Mobile Sources
Public Participation
Project Steering Committee (RPA's, DEP, EPA)
RPA Staff
Public Meetings (RPA Coordinated)
Responsiveness
Phase I Final Report
Development of Strategy Packages
Memorandum Identifying Principal Comments and Suggestions
Evaluation
Review of Phase I Public Participation Activities and Development of Phase II Public Participation Work Program

In addition to these major rounds of public meetings, other activities include informal presentations to SIPRAC subcommittees, progress reports and working meetings with a project steering committee consisting of representatives of four regional planning agencies, the Tri-State Regional Planning Commission, the Department of Environmental Protection and the U.S. Environmental Protection Agency. Attention is being given to direct interactions with groups so as to promote effective feedback on work being performed and collection of information.

An important component of public information and involvement also includes dissemination of study results. The basic Phase I analysis results are documented in the form of fifteen separate technical memoranda and copies of these are available for review at the Connecticut Department of Transportation and at each regional planning agency.[1] This report summarizes the results of those technical analyses in the form of one-page summary sheets, provided as Chapter IV. In addition, a brief summary report is available identifying overall project objectives and findings. All of this material can be considered to be in "draft" status, subject to revision as a result of comments received during both the review process and the second round of agency and public meetings.

Evaluation of Impacts

The coordinated, participatory process provides a framework for the planning, analysis and selection of transportation actions which will improve air quality within Connecticut. Specific impacts evaluated

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[1]The topic and coverage of each memorandum is defined as part of Table 1.

during the first phase screening analysis include not only air quality and transportation effects but also effects on energy consumption, the state's economy and development plans, social well being, and other matters of importance to the public. In addition, the feasibility of the proposals from political, institutional, and financial perspectives has been assessed in a preliminary manner. A more detailed listing of these impacts, which will serve as the basis for the Phase II analyses as well, is provided as Table 6.

Each of the fourteen policy areas identified in Table 1 was analyzed so as to develop information on the impacts listed in Table 6 and documented in the following general manner:[1]

1) Definition
   Specific variations or forms in which policy might be implemented.

2) Target Market Segment
   Specific trip purposes, population groups, geographic areas or travel segments affected.

3) Implementation Status
   A summary of the existing status within Connecticut of projects, studies, proposals or other implementation efforts, including a summary of conclusions or findings.

4) Related Objectives and Benefits
   Ways in which this program measure may contribute to the accomplishment of other local, regional, state and federal objectives.

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[1] Documentation is not provided for those impacts judged to be less important to a measure's desirability, feasibility or equity.

TABLE 6: Evaluation Criteria

Impacts on General Public

Urban, suburban and rural residents

Protected classes and special interest groups (poor, young, elderly, minorities, handicapped, transit dependent

Personal Safety

Cost to the individual taxpayer

Effects on travel by trip purpose (work, shopping, social/recreational)

Impacts on Business, Industry and Development

Employment levels by employment category

Development rates by type

Goods movement by type

Land use

Current expressway and arterial highway programs

Connecticut's competitive position

Implementation

Steps required to implement

Agency(s) responsible for implementation

Schedule for implementation

Legal restrictions to implementation

New or modified legislation required

Expected public attitude and response

Environmental Impacts

Travel behavior (vehicle miles of travel, mode choice, transit ridership, etc.)

NMHC emissions

Other air pollutants

Energy conservation

Other environmental factors

Costs and Revenues

Capital, operating and maintenance costs

Loss (or gain) in state and local revenues (gas tax, tire tax, registration fees, etc.)

Existing and/or potential sources of revenue (local, regional, state, federal)

Indirect or secondary costs

5) Travel Impacts
Changes in vehicle miles of travel (VMT), mode choice, trip frequency, destination choice, and (where appropriate) auto ownership levels.

6) Other Potential Impacts
Emissions, fuel consumption, safety, etc.

7) Costs and Revenues
Capital and operating taxes, tax revenues, gains or losses; costs to the individual taxpayer

8) Public and Business Acceptability

9) Enforcement and Other Implementation Issues
Steps required for implementation and legal and other possible implementation barriers; staff requirements.

10) Requirements for Interagency Coordination
Appropriate state, RPA, local and transit authority roles, including lead agency responsibility.

11) Recommendations
Appropriate next steps, priority to be given to this measure in Phase II, and the specific forms of the policy that should be pursued.

12) References
Appropriate Connecticut specific documents, and selected national literature than can be used to provide more depth.

Impacts on business, industry and development (Table 6) of transportation-air quality measures are complex, difficult to estimate, and cut across the majority of the transportation measures analyzed. For these reasons, a separate economic impacts analysis was performed, focussing for Phase I primarily on the identification of current statewide population, employment and economic trends, and underlying

conditions. Based on this understanding, it is then possible to develop assessments of potential direct and indirect impacts on economic development of the specific transportation measures analyzed.

A basic data source for the Phase I analyses has been the 1976-77 statewide home interview survey, used in conjunction with Connecticut DOT estimates of current travel conditions and forecasts of 1982 conditions. Certain policy analyses then are based on a systematic analysis of various cross-classifications of these data. Additional analyses utilized relatively simple economic methodologies for forecasting changes in travel behavior, generally either calculator or manually based. Emissions estimates are based on data provided in the U.S. Environmental Protection Agency publication, "Mobile Source Emission Factors" (March 1978). Where available and applicable, existing state and/or regional data and analysis results also were used; no new data collection has been performed as a part of this work program. Finally, the results of implementation experience in other U.S. states and urban areas provides a valuable base of experience upon which to evaluate potential Connecticut applications; such data have been used as a check on Connecticut-specific analysis findings. In summary, while attempts have been made to provide as much quantitative analysis as possible during the first phase screening, the methodologies utilized are nonetheless more qualitative and judgemental than those to be used during Phase II. One objective of the second phase analyses, therefore, is to refine and expand these preliminary estimates now being reported.

IV. Assessment of Impacts

Impact Analysis

The impact evaluations performed are presented in the following pages in the form of a series of one-page summary tables. The tables summarize more detailed and quantitative information contained in the available background technical memoranda, and are structured by individual transportation measure (Table 1). Where certain measures can be implemented in one of a number of different forms, these are defined by different columns on the corresponding summary sheet. Thirty-seven separate potential policies are summarized.

Each summary sheet contains a graphic key indicating both the nature and magnitude of nine important impact categories. A O symbol implies a generally adverse or negative impact; for example, a potentially high implementation cost. A ● indication means the effect is expected to be positive or favorable; for example, the general public is likely to favor implementation. The size of the dot conveys an estimate of the impact magnitude, with the larger size (of the three sizes used) representing the highest magnitude. A code of "NS" means that the impact is not expected to be significant for this particular measure.

Each summary sheet also contains a brief recommendation with respect to the kinds of activities that may be appropriate for the second phase analyses. Specifically, the recommendations (with the exception of high occupancy vehicle priority lanes) are not project specific and are not intended for use in determining specific implementation priorities. Rather, the orientation is to achievement of the State's air quality goals.

Transportation Measure Summary Tables

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Policy Measure: EXPANSION OF BUS TRANSIT FLEET BY 50, 100, and 500 PERCENT

Definition	The expansion of the statewide bus transit fleet by three different degrees: 50%, 100% and 500%. From 1976 to 1980, the statewide fleet increased by approximately 30%.				
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups	All trips. Primarily urban areas although the 100% and 500% expansions would probably reach the ex-urban and rural areas to some extent. Most groups.				
		50 Percent Increase		100 Percent Increase		500 Percent Increase
Travel Impacts	●	An increase of 25.4% or 22,315 riders per day and a decrease of .2% or 118,000 VMT per day anticipated.	●	An increase of 50.0% or 43,986 riders per day and a decrease of .4 or 236,000 VMT per day anticipated	●	An increase of 500% will not produce 5 times the benefits of a 100% increase because of decreasing marginal returns. An increase of 130% or 114,375 riders per day and a decrease of 1.1% or 649,000 VMT per day is anticipated.
Emissions Impacts	●	A reduction of .39 tons/day or .12% of NMHC/day is anticipated	●	A reduction of .78 tons/day or .23% of NHMC/day is anticipated	●	A reduction of 2.02 tons/day or .61% of NMHC/day is anticipated.
Other Significant Impacts	●	Annual fuel savings of .7 million gallons anticipated.	●	Annual fuel savings of 1.2 million gallons anticipated.	●	Annual fuel savings of 4.1 million gallons anticipated.
Costs-Initial (Annual) -Continuing (Annual)	○	$25 million	○	$50 million	○	$250 million
Revenue Effects	○	$5.0 million in increased operating deficit.	○	$14.2 million in increased operating deficit.	○	$105.4 million in increased operating deficit.
Impacts on Economic	NS	The impact of the increase will probably be felt more by those already residing in the state and will not be perceived by those out of state.	NS	An increase of this magnitude would increase mobility for short trips but would not necessarily be an effective way to increase labor market areas	●↓○	A 500% increase could lay the foundation of an extensive and comprehensive statewide service and would attract employees for that reason. Increased taxes might serve as a deterrent to industry location in Connecticut, however.
Business & Public Acceptability	●	Widely acceptable, though increased taxes could result in opposition.				
Implementation Issues	○	Ability to purchase new equipment is a major constraint.				
Recommendations	At least moderate expansion of the bus transit fleet should be analyzed as part of the Phase II packages.					

Valley Metrorail: ELIMINATION OF BUS TRANSIT FLEET BY 30, 100, and 300 PERSONS

Policy Measure: EXPANSION OF OFF-PEAK SERVICE

Definition		Expansion of off-peak transit service includes utilization of the required peak period vehicles throughout the day to improve midday level of service. Currently, off-peak vehicle utilization ranges from 50-70 percent of peak period vehicle requirements.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Primarily non-work, off-peak discretionary trips Urban areas Non-working people, elderly
Travel Impacts	NS	Very small, less than 5% ridership increase; insignificant mode split and VMT change (much of new ridership is generated from non-choice riders).
Emissions Impacts	NS	Not significant
Other Significant Impacts	NS	None
Costs-Initial	NS	None
-Continuing	o	$1.1 in added deficit for Connecticut Transit systems alone.
Revenue Effects	NS	No significant revenue effects anticipated.
Impacts on Economic Development	NS	No significant impacts expected.
Business & Public Acceptability	● ↓ o	This measure would be generally acceptable except for its high relative cost.
Implementation Issues	o	In order to increase midday service using available vehicles, regular maintenance functions would have to be shifted to the evening and/or overnight time slots.
Recommendations		Due to the small projected impacts and high relative cost of off-peak service expansion, no further consideration is recommended at this time. Instead, selected off-peak service improvements should be analyzed on a regional level.

Policy Measure: MODAL INTERFACE IMPROVEMENTS

Definition		This measure includes improvements in bus-to-bus and rail-to-bus schedule coordination.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		 Primarily work trips and long-distance shopping, social-recreation trips. Primarily urban areas None
Travel Impacts	NS	Such improvements have already been implemented in many Connecticut cities. Further improvements would have little or no overall impact on transit mode share and statewide VMT.
Emissions Impacts	NS	Not significant
Other Significant Impacts	NS	None.
Costs-Initial	—	Unknown
-Continuing	—	Unknown
Revenue Effects	NS	No significant revenue impacts expected.
Impacts on Economic Development	NS	No significant impacts on economic development expected because of the subtlety of the measure.
Business & Public Acceptability	•	General acceptable
Implementation Issues	o	Improved schedule coordination often requires improved vehicle storage facilities at key transfer points and added vehicle requirements for one or both of the lines with common transfers.
Recommendations		While this measure should be continually applied in the on-going transit planning process, its overall impacts do not justify further consideration in this study.

Policy Measure: REDUCTION IN TRANSIT FARES

Definition		Includes a general transit fare reduction to encourage increased ridership. For practical purposes, this measure can be defined as a reversal of the recent (March, 1980) statewide fare increase which raised base cash fares from 35¢ to 50¢ and other fares proportionally. Further reductions are analyzed (50¢-20¢) but are not practical (nor effective) given the importance of farebox revenue in financing transit operating cost and the already low relative cost of transit as compared to auto use.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		All trips, with greater impact on off-peak, non-work travel and discretionary trips. Primarily urban areas. Primarily low and middle income groups; choice riders.
Travel Impacts	NS	Maximum Impacts (Daily) — 50¢ → 35¢ — 50¢ → 20¢ Change in Ridership (Statewide): +7,500 (+7%) — +15,000 (+14%) Change in VMT (Statewide): -15,860 (-0.03%) — -31,720 (-0.06%)
Emissions Impacts	NS	.053 tons/day or .02% NMHC reduction based on VMT reduction (50¢ 35¢) .106 tons/day or .04% NMHC reduction based on VMT reduction (50¢ 20¢)
Other Signficant Impacts	•	$100-$200 annual savings for each transit user 874,000-1,749,000 gallons of gas annually
Costs-Initial -Continuing	NS	None
Revenue Effects	O	$5-$10 million loss in annual transit operating revenues.
Impacts on Economic Development	NS	The impact on travel is sufficiently marginal such that this measure will not significantly enhance the state's marketability.
Business & Public Acceptability	• ↓ O	Some opposition to increased subsidies required by this measure can be expected; if fare reductions are accompanied by required service reductions, major opposition would most likely develop.
Implementation Issues	NS	None other than the need to identify an alternative transit funding source.
Recommendations		Based on the minimal impacts of a general fare reduction and its high on-going cost, it is recommended that this measure be dropped from further consideration.

Policy Measure: DIFFERENTIAL FARE POLICY FOR PEAK AND OFF-PEAK TIME PERIODS

Definition		Two alternative fare structures have been analyzed: 1) a 50¢ peak period fare with a 35¢ off-peak fare, and 2) a 65¢ peak period fare with a 35¢ off-peak fare. Connecticut has no prior experience with differential time-of-day fares.		
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		1) off-peak non-work travel (2) all trip purposes with greater impact on off-peak non-work travel Primarily urban areas Primarily low and middle income groups; choice riders		
		ALTERNATIVE 1		ALTERNATIVE 2
Travel Impacts	●	An increase in daily ridership of 5,950, 5.6% and a decrease in daily VMT of .02% or 12,575 miles.	●	An increase in daily ridership of 4,230 or 4.0% and a decrease in daily VMT of .02%
Emissions Impacts	NS	A reduction of .042 tons of NMHC per day can be anticipated.	NS	A reduction of .031 tons or .01% of NMHC per day can be anticipated.
Other Significant Impacts	NS	No significant impacts on safety, congestion, fuel conservation can be expected.	NS	No significant impacts on safety, congestion, fuel conservation can be expected.
Costs-Initial -Continuing	NS	No significant cost effects anticipated.	NS	No significant cost effects anticipated.
Revenue Effects	○	Reduces operating revenue by approximately $1.4 million annually.	●	Increase annual operating revenue by $.6 million annually.
Impacts on Economic Development	NS	Since this measure is oriented to off-peak trips, it will not enhance the image of the state as a corporate location significantly.		
Business & Public Acceptability	○	While most of the general public will accept a differential fare structure, there will undoubtedly be some opposition from individuals who view such policies as inequitable.		
Implementation Issues	○	Significant opposition to this measure can be expected from bus drivers who must enforce differential time-of-day fares. Transition periods are especially troublesome when passengers refuse to pay the higher of two fares. While some policies (such as an informal transition period) may reduce this problem, it can never by completely eliminated.		
Recommendations		Given the small impact of this measure on statewide emissions, it is recommended that further consideration of this measure be given a low priority. If a fare increase becomes necessary in the future, however, strong consideration should be given to a differential structure to minimize total ridership loss. More information is required to more accurately estimate time-of-day fare elasticities in Connecticut, and a broader range of differential fare alternatives might be examined.		

Policy Measure: INCREASED PROMOTION AND FINANCIAL DISCOUNT FOR PRE-PAID TRANSIT PASS PROGRAMS

Definition		Strategies to increase regular use of transit through purchase of pre-paid monthly transit passes including purchase price discounts, encouragement of employer participation in the pass program, and partial employer subsidy of employee passes. While most transit systems in Connecticut have some type of pass program currently, employer participation in the program varies widely.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Primarily work trips, although other trip purposes are usually made via transit by regular pass holders. Primarily urban areas Primarily regular or semi-regular transit users
Travel Impacts	NS	Although some new transit trips might be generated by new passholders, there is no evidence to suggest that pass promotions, discounts, or higher subsidies divert auto users to any significant degree or affect overall statewide VMT.
Emissions Impacts	NS	No significant emission impacts anticipated.
Other Significant Impacts	NS	No other significant impacts anticipated.
Costs-Initial	NS	Minimal marketing cost
-Continuing	NS	
Revenue Effects	•	Employer subsidy of passes may increase transit operating revenues as user may be encouraged to purchase passes. Deeper purchase price discounts would have a significant detrimental effect on operating revenues.
Impacts on Economic Development	•	While pass programs may not encourage additional transit use, employer administarted programs improve management-labor relations and enhance corporate images making the state more attractive as a location choice.
Business & Public Acceptability	•	These measures should be generally acceptable except to employers who are unwilling to become involved in employee transportation issues.
Implementation Issues	○	There appears to be no easy mechanism to encourage greater employer responsibility for transit pass promotion and/or subsidy.
Recommendations		Since employer promotion and subsidy of transit passes does seem to increase regular transit use among employees, it is recommended that the encouragement of such action be undertaken as part of regional employer-directed ridesharing programs. For purposes of this study, however, such promotion, in itself, will have no significant impact on emissions and need not be considered further except as a part of an overall ridesharing promotion strategy.

Policy Measure: BUSPOOLING AND FINANCIAL ASSISTANCE FOR STARTING COSTS

Definition		Buspools are subscription, work-trip bus services which generally cater to the longer distance commuters (e.g., more than 20 miles one-way) and for which riders pay most or all of the cost of providing the service. Numerous buspools currently operate to and from Connecticut's largest employers; some with active employer sponsorship and subsidy, others which have developed completely independently of both employers and public transit agencies.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		 Work trips Very long distances, suburban-urban, suburban-suburban, rural-urban, rural-suburban, intercity Long distance commuters
Travel Impacts	●	Change in transit sirderhip: +18,356 to +30,137 riders per day VMT reductions of approximately .2% to .3% are expected.
Emissions Impacts	●	Emission reductions of .55 tons, or .17%, to .92 tons or .27% of NMHC per day can be anticipated.
Other Significant Impacts	●	Fuel conservation goals will be served, however, the fuel savings will be lower than the VMT reductions because longer distance, more fuel efficient trips are being eliminated.
Costs-Initial	○	$32.4-$52.8 million (2709-440 vehicles)
-Continuing	o	Continuing operating and maintenance costs expected
Revenue Effects	o	Revenue from riders and/or employers may pay full operating costs.
Impacts on Economic Development	●	Buspooling by increasing the area from which any major manufacturer can draw employees makes the state a more attractive location for both industry and labor.
Business & Public Acceptability	●	This measure would be generally acceptable although the operation costs for buspools may not remain competitive with carpools and vanpools and the general public may opt for the smaller vehicle, less expensive service.
Implementation Issues	o	The bus certification process must be simplified or eliminated for certain types of trips. Existing public and private transit operators may oppose rapid buspool expansion.
Recommendations		The buspool concept has proven beneficial, although it is recommended that it be integrated with vanpool measures for Phase II. The Phase II effort should also identify more alternatives for funding the up-front costs of new buspools and recommend one or more favored mechanisms.

Policy Measure: USE OF SCHOOL BUSES DURING SUMMER PEAK POLLUTION PERIOD AND OTHER NON-SCHOOL PERIODS

Definition		Preliminary assessments of widespread use of school buses in Connecticut for non-pupil transportation. While this concept has been implemented on an ad-hoc basis in individual towns in the state, the practice is not at all common currently.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Midday shopping, social-recreation trips; summer recreation trips. Statewide application appropriate. Elderly, youth.
Travel Impacts	•	An increase in daily ridership of 33,000 or 50% and a decrease in daily VMT of 162,191 miles, or .3% is anticipated for midday service. Changes resulting from summer all-day service are expected to be an increase of 49,000 or 75% for daily ridership and a decrease of 243,287 miles, or .45% for daily VMT.
Emissions Impacts	•	Decreases in NMHC of .2% or approximately 2/3 ton per day for midday service and .3% or approximately 1 ton for summer all day service are anticipated.
Other Significant Impacts	o	Fuel savings are likely to be small because of gas burned by school buses and small number of former auto users. School bus life may be shortened and significantly increased maintenance required.
Costs-Initial	o	There may be some vehicle modification costs required for safety reasons.
-Continuing	O	$26 million in new subsidies, $1.60 per new passenger trip (more than four times the current transit subsidy per passenger.)
Revenue Effects	•	New revenue will be generated by induced trips.
Impacts on Economic Development	NS	The focus of this measure upon non-work trips will make Connecticut a more attractive place to live, but will not offer any particular attraction to prospective employers.
Business & Public Acceptability	•	While this measure would most likely receive general public endorsement, public acceptance of the concept of adults riding regularly on school buses may be slow in developing.
Implementation Issues	o	Legal restrictions would have to be changed to allow greater alternative use of school buses and certification requirements reduced significantly. Physical modifications may also be required to make the vehicles both safe and comfortable for the general public.
Recommendations		The cost of providing widespread alternative use of school buses is prohibitive and other transit strategies seem potentially more effective for the same subsidy levels. Combined with the implementation barriers noted above, this measure should be relegated to a contingency measure in emergency air pollution and energy shortage situations only.

Policy Measure: RAIL PASSENGER SERVICE IMPROVEMENTS

Definition		Rail construction in lieu of major post-1981 highway construction. Addition of new commuter rail facilities (primarily on or feeding the New Haven-New York service). These improvements are in addition to the already substantial rail passenger service network which the state currently maintains.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Primarily work-trips for rail transit; all trip purposes for highway construction Urban areas, intercity Rail improvements will serve primarily middle and upper income commuters
Travel Impacts	↓ NS	Increases in transit ridership within the corridors affected will approximately double from the development of new rail transit service in Hartford region. Only a portion of the new riders, however, would be diverted choice users; consequently, areawide VMT reduction is estimated to be about 1.3%. Improvements to the New Haven-New York branch lines would have substantially less impacts (probably on the order of a 10% increase in ridership). On a statewide basis, desirable rail passenger system improvements are expected to decrease VMT by less than 0.2%.
Emissions Impacts	↓ NS	While meaningful reductions on a percentage basis are possible within specific Hartford corridors, overall 1982 statewide reduction of NMHC is estimted to be about 0.4 tons/day or 0.12% on a statewide basis.
Other Significant Impacts	o	Will tend to encourage higher density development immediately adjacent to proposed stations, but also may allow commuters to lengthen the distance of their work trips.
Costs-Initial	◯	Substantial ($230,000,000 for three-corridor Hartford service)
-Continuing	O	Substantial ($9,000,000/year for three-corridor Hartford service)
Revenue Effects	O	Revenue is not expected to cover annual operating costs.
Impacts on Economic Development	●	Rail improvements will undoubtedly spur greater economic development along improved corridors and increase the residential attractiveness of communities served.
Business & Public Acceptability	●	General concept of rail transit enjoys significant public approval although it is not clear whether the subsidy requirements for significant new rail development are understood by the general public in any meaningful way. Specific rail improvement projects may generate strong community opposition.
Implementation Issues	O	Improvements in rail passenger service in Connecticut must be coordinated with Conrail, Amtrak and, in some cases, the New York MTA. This coordination and development of operating and funding agreements may be complex and time-consuming. In addition, the planning, design and construction of rail projects requires many years and such projects cannot be in place by 1987. The availability of adequate funding, both nationally and within the state, to support the construction of extensive new rail projects also is likely to be a problem.
Recommendations		Rail and highway projects serve significantly different objectives and markets; these two measures cannot be easily compared and such comparison does not provide a meaningful examination of the benefits of either alternative. While specific rail passenger projects may be desirable in specific urban areas having high density travel movements (such as New York City and possibly Hartford), such projects will be expensive and are not expected to yield large reductions in statewide NMHC emissions relative to other possible strategies. Consequently, it is recommended that construction of new rail transit facilities not be included as part of the Phase II analysis. A next possible step, however, in the consideration of rail improvements is the systematic identification and prioritization on a statewide basis of the specific corridors in which rail improvements may be desirable.

Policy Measure: MANDATORY EMPLOYEE/VEHICLE RATIOS

Definition		Require employers to reduce the supply of parking which they provide to employees. Short-term action will involve chaining or otherwise isolating portions of existing parking lots. Long-term strategies may involve freezes on parking space construction. To be effective, occupancy restrictions also would be required at commercial and municipal facilities.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Work trips made by automobile. Statewide application of measure appropriate. Will only be effective in places where total parking supply is constricted. Employees of companies of 150 or more would be targetted to ensure feasibility of complementary ride sharing programs.
Travel Impacts	●	5% reduction in VMT is possible with an employee/vehicle ratio of .4 and a 10 AM commercial/municipal occupancy rate of .3.
Emissions Impacts	●	5%
Other Significant Impacts	○	Spillover parking into surrounding residential and commercial neighborhoods will cause conflicts over space between residents and non-residents and short/long term parkers. Spillover will also aggrevate congestion (and accident rates) during peak hours. Commercial parking garages with decreasing marginal rate structures may suffer a loss in revenue.
Costs-Initial	o	Costs will be incurred in setting up necessary complementary ride-sharing programs and in developing a parking utilization plan.
-Continuing	o	Enforcement costs will dominate but the need for expanded ridesharing programs will contribute.
-Total	o	$.5 million/million population.
Revenue Effects	o	Program must be funded probably exclusively from state sources. Also, additional funding will be required for expanded transit and ridesharing services.
Impacts on Economic Development	○	Mandatory requirements will have a negative impact on attracting and keeping employers and skilled labor within the state.
Business and Public Acceptability	◯	Public and business reaction is likely to be very negative.
Implementation Issues	◯	Local assistance may become critical to successful implementation and enforcement will place an additional burden on police. Potential major legal questions may be raised if implementation is mandatory.
Recommendations		Mandatory employee/vehicle ratios are potentially effective in reducing NMHC emissions on a statewide basis, but only with a very high implementation cost and strong public opposition. Such measures no longer are being examined even as energy contingency measures and are not recommended for inclusion in the Phase II analyses. Their potential use should be limited to voluntary targets.

Policy Measure: ELIMINATION OF DRIVE-IN WINDOWS

Definition		Reduction in windows in fast food outlets, banks, etc. Valley RPA has already begun this process and has inventoried existing facilities
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		 Shopping and personal business trips would be primary targets. Statewide application; more important in suburban areas. Consumers travelling for discretionary reasons.
Travel Impacts	NS	Travel impacts measured in terms of VMT are expected to be minimal.
Emissions Impacts	•	Emissions reductions can be anticipated due to reduced vehicle idling, though positive effects somewhat offset by increased number of hot starts. Annual NMHC emission reductions of 335 tons may be possible.
Other Significant Impacts	•	Fuel consumption would be decreased. Travel circulation problems will be ameliorated by the curtailment of vehicle movement around traffic generators (photo-processing centers, for example) currently located in parking lots.
Costs-Initial	o	Compensation payments and physical barrier erection costs will dominate initial costs. Public information also will be required.
-Continuing	NS	No significant continuing costs are anticipated.
-Total	o	$.2 million/million population
Revenue Effects	NS	Small amounts of lost revenues from businesses shut down entirely.
Impacts on Economic Development	NS	No significant impacts on economic development are anticipated. Statewide application would prevent most arguments of relative hardship.
Business and Public Acceptability	o	No significant objections or support can be expected from the public. Objections, however, may be leveled by affected businesses. Any real cases of undue hardship may require compensation.
Implementation Issues	o	Implementation should be straightforward, though municipal zoning changes will be required. Retroactive changes, i.e., removal of existing facilities, will be more difficult than preventing construction of new drive-in windows. Flexible changes such as chaining entrances would appear more popular and easier to implement than permanent architectural design changes. Enforcement should be straightforward and an ongoing part of natural observation not requiring additional person-hours.
Recommendations		Relatively even distribution of impacts would be involved and low, though meaningful, reductions in emissions would result. Implementation effort, however, would be at least modest with the potential existing for controversy. A more detailed assessment of potential impacts is recommended prior to inclusion in any of the Phase II strategy packages to be analyzed.

Policy Measure: LIMITATION ON NUMBER OF MOTOR VEHICLE REGISTRATIONS

Definition		Reduce the number of motor vehicles which may be legally operated to limit total travel. Total quotas, limitation by maximum emissions levels and limitation by households are three methods for imposing restrictions. It is assumed that the first would be used in combination with the second or third in order to limit appeals.		
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		LIMITATION BY MAXIMUM EMISSIONS LEVELS All trip purposes Statewide, rural locations disadvantaged Low income groups (owning older cars on average) and one-auto households would be most heavily impacted		LIMITATION BY HOUSEHOLD Primarily non-work discretionary travel Statewide, rural and inner-city residents impacted Middle and upper income groups (currently averaging 2-2.3 cars/household) would have to make most significant changes in lifestyle
Travel Impacts	●	1-2% decrease in VMT depending upon severity of constraint	●	Increased trip chaining expected. Social and recreational travel expected to continue as normal. Smaller reductions in total travel than other means of limiting auto registrations
Emissions Impacts	●	1-2% emissions reductions expected as accelerated fleet turnover is induced, auto occupancy is raised and unnecessary trips are foregone.	●	1% emissions reductions expected as VMT falls and ratio of hot/cold starts is increased.
Other Significant Impacts	•	Losses in mobility, with some employees having difficulty reaching work; accidents expected to drop with VMT	NS	No significant impacts on safety, retail volumes, or protected classes anticipated
Costs-Initial	O	Can be operated as part of vehicle I/M program	o	Set up of administrative structure, surveys, and household unit designation
-Continuing	o	Continuing operation; heavy enforcement	o	Continuing operation; enforcement
-Total	O	$1.2 million/million population	O	$1 million/million population
Revenue Effects	NS	Increased revenue from users testing fees offset by losses in registration fees.	o	Revenue loss due to decreased number of registrations.
Impacts on Economic Development	O	Would contribute to a negative reaction associated with stringent state regulations and a difficult environment for business development.	o	A milder reaction since most discretionary travel will be rescheduled rather than foregone. Still some negative reaction against regulation will discourage business from remaining or locating in Connecticut.
Business & Public Acceptability	O	Severe objections by groups suffering significant hardship can be expected: public sympathy against system probable. Businesses probably negative.	o	Objections will be widespread but possibly could be partially addressed by an effective appeals board.
Implementation Issues	◯	High number of appeals can be expected; inequity of measure may be controversial; violations anticipated.	O	Moderate number of appeals anticipated: black market in household designation stickers expected to develop; enforcement difficult.
Recommendations		Because these measure are both very restrictive and very difficult to implement relative to expected emissions savings, it is recommended that both of these types of restrictions not be analyzed as a part of Phase II. Limitation by maximum emissions, while more effective, is also more controversial. Limitation by household has insufficient evidence to merit expenditure of resources during Phase II		

Policy Measure: ONE-DAY-A-WEEK DRIVING BAN

Definition		Automobiles would be banned from Sunday driving or would be banned from driving on a chosen day of the week. Weekday stickers would be issued on either a household basis or a vehicle basis. Drivers may choose stickers or they may be assigned by state. Alternatively, license plates may be used to identify cars.		
Target Market Segment - Trip Purpose - Geographic Impacts - Special Groups		WEEKDAY BAN (Driver Choice, Vehicle by Vehicle Ban) All trip purposes, though primarily work Statewide Lower income groups will be most heavily impacted (due to low average car ownership)		WEEKEND BAN All trip purposes, though primarily non-work Statewide All auto drivers will be impacted
Travel Impacts	●	5% VMT reductions	●	Some VMT reductions due to foregone social and recreational travel expected; probably 1-2%
Emissions Impacts	●	5% reductions of NMHC	•	Some emissions reductions due to decreased trip making expected. Would correspond to VMT decrease
Other Significant Impacts	○	No significant safety impacts anticipated. Also could create personal inconvenience.	◯	Some safety impacts are expected as weekend and holiday travel generally has higher accident rates than work travel.
Costs-Initial	○	Heavy administrative and public information costs would be required	o	Public information and administrative costs
-Continuing	o	Major enforcement	NS	Enforcement
-Total	○	$1.4 million/million population	o	$.2 million/million population
Revenue Effects	NS	No potential sources of revenue have been identified except for fines.	NS	No potential sources of revenue have been identified except for fines.
Impacts on Economic Development	◯	Authoritarian actions by governments can generally be expected to repel private businesses leary of interference in their own production activities and could hurt the state's competitive position.	◯	Negative impacts on economic development expected for the same reasons as for a weekday ban. Negative impacts on entertainment and recreational industries expected as well.
Business & Public Acceptability	○	Strong objections are expected from the public and from employers as people are forced to reorganize their trip-making	◯	Public reaction is expected to be very hostile. Businesses which would prefer to open on Sundays also will be opposed.
Implementation Issues	○	Allowing drivers to choose stickers will require a mail-back and response mechanism which will require well-coordinated administration: moderate number of appeals expected	◯	Severe implementation problems exist to the extent that this policy measure can probably be overturned on constitutional grounds under all but emergency situations
Recommendations		It is recommended that neither of these measures be analyzed during Phase II, and that they be examined only as possible energy contingency measures. A weekday ban is expected to be relatively effective, but not particularly popular, and difficult to implement and enforce. A Sunday or weekend ban is expected to be equally controversial, but relatively less effective. Both forms are expected to have negative development impacts.		

Policy Measure: GASOLINE RATIONING

Definition		Reduce the supply of gasoline distributed to passenger vehicles by constraining supply to be below demand. Coupons issued by household which could be either sold or non-negotiable.				
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Primarily non-work trips would be affected Statewide, though realistically rationing would have to be implemented on either a regional or national basis to be effective given the small physical size of Connecticut. Free market pricing will penalize lower income groups; and non-negotiable coupons will affect upper and middle income groups most heavily.				
Travel Impacts	●	Rationing programs have strong potential to alter trip-making patterns though some people will cross over the state borders to get gas. A target of 15% reduction in fuel consumption normally is assumed for rationing.				
Emissions Impacts	●	Reductions in travel and fuel will be reflected in a corresponding 15% emissions reduction.				
Other Significant Impacts	○ ↓ ●	FREE MARKET PRICING Regressive impact on poor and rural areas. Faster fleet turnover.	•	NON-NEGOTIABLE COUPONS Accelerate turnover to more fuel efficient cars.	•	NEGOTIABLE COUPONS Income transfer from mod erate and high to low income groups likely. Faster fleet turnover.
Costs-Initial	NS	No significant costs to the state beyond public information.	○	Printing and distribution of coupons; heavy enforcement, public information, and administration	○	Printing and distribution of coupons; appeals boards, mod-erate enforcement, public information, and administration
-Continuing	NS	No significant costs	○	Same as initial costs	○	Same as initial costs
-Total	NS	No significant costs	○	$1.6 million/million population	○	$1.2 million/million popula-tion
Revenue Effects	•	Excess profits taxes on re-tail gasoline dealers	NS	No significant sources of revenue foreseen	NS	No significant sources of revenue anticipated.
Impacts on Economic Development	◯	Rationing programs because of their severity are not generally viable for state by state implementa-tion because they put each implementing state at a relative disadvantage. With a weakened competitive position, losses will be aggrevated and gains dampened. A rationing system will make the state less attractive to employees as well as potential employers.				
Business & Public Acceptability	○	FREE MARKET PRICING Negative	◯	NON-NEGOTIABLE COUPONS Very negative.	◯	NEGOTIABLE COUPONS Very negative.
Implementation Issues	○	New monitoring procedures needed at breakbulk facilities to limit supply.	○	Black market will develop and an appeals board will be needed	○	Coupon distribution system will be required.
Recommendations		It is recommended that rationing programs be considered only as an energy contingency measure. Additional analysis during Phase II is not appropriate.				

Policy Measure: WEEKEND BAN ON GASOLINE SALES

Definition		A weekend ban on gasoline sales to passenger vehicles and other vehicles (such as light-duty trucks) being used for recreational vehicles. Diesel fuel sales would not be affected; gasoline sales to heavy duty vehicles would not technically be restricted, but may be de facto by station closings.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		 Primarily long-distance recreational, social, and shopping trips. Statewide Upper and middle income groups who currently enjoy greater discretionary travel would be more heavily affected.
Travel Impacts	●	Major travel impacts are not expected during the normal working week, although increased queues likely will occur at gas stations on the last day they are open. Weekend travel reductions of 10-20% could be expected.
Emissions Impacts	●	Weekend reductions of 10-20%. These, however, are not normally days of peak pollution problems.
Other Significant Impacts	○	Recreational businesses may suffer as both Connecticut and all New England residents plan holidays and weekend trips in areas outside of Connecticut.
Costs-Initial	o	Initial costs for sorting out exemption programs, waivers, and public information.
-Continuing	NS	No significant continuing costs have been identified.
-Total	o	$.2 million/million
Revenue Effects	NS	Decrease in gasoline revenues.
Impacts on Economic Development	○	A negative impact on the State's business climate can be anticipated as private businesses resist states where active government intervention is perceived as prevalent. Recreational and tourism industries would be at least moderately affected.
Business & Public Acceptability	○	Public reaction will be negative. Certain business sectors can be expected to object strongly; others depending only on local clientele should be relatively neutral.
Implementation Issues	o	This program should be relatively straightforward to implement. Special waivers will have to be issued for stations remaining open to serve heavy duty and emergency vehicles. If implemented only within Connecticut, however, many motorists could easily cross state lines to obtain gasoline and thereby subvert the intended objectives.
Recommendations		Unless implemented throughout New England, the effectiveness of a weekend ban would be severely undermined. Given potential negative impacts on recreation and tourism, public opposition and exemption difficulties combined with the fact that a weekend ban does not direcly influence peak period air pollution levels, it is recommended that this measure not be analyzed as a part of Phase II. Use of a weekend ban on gasoline sales, however, is a logical component of an energy contingency program.

Policy Measure: LIMITATION ON NUMBER OF DRIVER'S LICENSES

Definition		Reduce the total number of licensed drivers by periodic competence testing or by raising minimum age requirements and/or by setting maximum age limits.		
Target Market Segment - Trip Purpose - Georgraphic Impact - Special Groups		AGE RESTRICTIONS All trip purposes Statewide application appropriate Young and old		COMPETENCE RESTRICTIONS All trip purposes Statewide application appropriate Less competent drivers
Travel Impacts	●	Potential 3-5% decrease in travel. Increased incidence of touring anticipated as more people become driver dependent.	●	Potential 1-3% decrease in travel. Discretionary travel may develop greater peaking as after-work tours are arranged.
Emissions Impacts	●	Proportional to VMT savings as discretionary travel is reduced and auto occupancy is increased.	●	Same as VMT reduction
Other Significant Impacts	•	Some increases in safety as VMT is reduced and older drivers are not relicensed.	●	Increased safety and reduction of property damage losses anticipated.
Costs-Initial	NS	No significant increases in costs expected	NS	No new initial costs anticipated as testing system is in place
-Continuing	NS		o	Larger number of people requiring testing annually combined with more rigorous testing procedures will increase current annual costs.
-Total	NS		o	$.7 million/million of population
Revenue Effects	NS	Some lost licensing fees as driver pool is restricted; fees can be raised to compensate.	NS	More intricate testing procedures used to justify higher fees.
Impacts on Economic Development	NS	No significant impacts on economic development anticipated.	NS	No significant impacts anticipated.
Business & Public Acceptability	o	Those age groups no longer qualifying for licenses can be expected to object.	NS	Public reaction is expected to be neutral to slightly positive: Perception of change as a safety issue will aid acceptance.
Implementation Issues	NS	Legislation would be required, and any attempts at retroactivity would be difficult. Transition period would be required to phase policy into operation.	o	Legislation would be required. Tri-annual testing would require expanded testing facilities and staff; incidence of re-testing expected to increase.
Recommendations		Since competence limitations are expected both to receive public support as a safety issue and to potentially result in reduced emissions, additional analysis during Phase II may be desirable.		

Policy Measure: INCREASED FUEL TAXES

Definition		Gasoline sales tax may be increased to discourage low-occupancy vehicle usage and to encourage faster fleet turnover to newer, more fuel-efficient cars.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		All trip purposes Statewide Groups on low or fixed incomes would be affected disproportionately.
Travel Impacts	●	A doubling in the price of fuel would decrease work trip VMT by 1-4% and non-work VMT by 15-25%.
Emissions Impacts	●	NMHC emission reductions would be lower than the corresponding VMT decreases; 1-3% for work and 10-15% for non-work travel.
Other Significant Impacts	•	Adverse impact on low income groups.
Costs-Initial -Continuing	NS	No significant costs expected. Necessary enforcement and administrative mechanisms in place already.
Revenue Effects	●	Beneficial revenue effects with positive impacts on the highway fund.
Impacts on Economic Development	NS	Significant impacts on economic development are not expected unless very large changes are made.
Business & Public Acceptability	o	Business and public acceptability will hinge on four basic variables: 1) the staging of the increase; 2) the severity of the increase; 3) the method of promotion; and 4) the perceived distribution of the burden. Connecticut already has the highest fuel sales tax in the country. Large increases are necessary to be effective, and both state legislatures and Congress have been reluctant to approve even small increases.
Implementation	•	Implementation procedures are relatively straightforward, but would be controversial. Exemptions should not be an issue.
Recommendations		It is recommended that increased fuel taxes be pursued for energy rather than air quality reasons. Phase II pricing related measures analyzed should focus on incentives related to increased transit and ridesharing utilization.

Policy Measure: INCREASED AUTO OWNERSHIP FEES

Definition		Fees structured and/or increased to encourage a rapid auto fleet turnover to newer cars with lower emission rates.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		 All trip purposes Statewide Lower income groups will be impacted as a result of the regressiveness of a tax structure penalizing the owners of older cars.
Travel Impacts	NS	No significant impacts on travel patterns are anticipated. This measure is explicitly not designed to do this.
Emissions Impacts		Difference in used auto car ownership costs and those for new cars of $100 has been calculated to induce a .7% reduction in NMHC. Widening that gap to $400, however (by increasing used auto costs while decreasing new auto taxes, etc., for example), can yield a 3.3% change.
Other Significant Impacts	●	Newer cars are generally much more energy efficient and therefore corresponding positive contributions to energy conservation are anticipated. Increased use of passive restraint systems and other safety features reduce the incidence of both fatal and non-fatal accidents as fleet turnover is induced. Smaller vehicle size, however, may offset these safety gains. New car sales can be expected to increase.
Costs-Initial -Continuing	NS NS	No significant costs are anticipated on either an initial or continuing basis.
Revenue Effects	-	By increasing used car registrations fees by either $10.90 or $54.00, new cars sales tax reductions of $89.10 or $346.00 would be financed respectively. There is no necessary loss in state revenues, if the changes can be balanced.
Impacts on Economic Development	NS	No signficant impacts are anticipated.
Business & Public Acceptability		Those groups forced by economic circumstances to own used cars will object to substantial increases in their registration fees. Those regularly buying new cars can be expected to support the measures although not in an organized way. Businesses have little reason to be other than neutral. Sales at new car dealerships should increase. Used car sales and therefore prices will fall.
Implementation	NS	Current enforcement and administrative structures are considered adequate. Higher fees should not introduce substantial new problems in fee collection.
Recommendations		Because the implementation costs are minimal and the programs can be structured in such a way as to produce no net loss in State revenues, it is recommended that this measure be included as part of the Phase II analysis.

Policy Measure: INCREASED AUTO OWNERSHIP FEES

Deflation	
Target Market Segment - City Purpose - Geographic Impact - Special Groups	All city purposes Statewide Lower income groups will be impacted as a result of the regressiveness of a flat fee structure irrespective of the amount of other taxes
Travel Impacts	No significant impacts on travel behavior are anticipated. This measure is not likely to be designed to do this.
Emissions Impacts	Minimal impact on emissions. Note that gas guzzler fees have been in effect since 1980. Assuming that gas goes to $800, however (as in a 5¢ equation in 1980), existing fees, for example, may yield a 2-3% change.
Other Significant Impacts	Fees are generally much more easily collected and therefore corresponding economic activity is to energy conservation are substantial. Increased use of gasoline reduces air pollution and reduces the incidence of both fatal and non fatal accidents as fuel consumption is cut. Smaller vehicle sizes however, may offset these safety gains. New tax rate is expected to produce
Short-Term Impacts	No significant costs are anticipated as an effect of initial or continuing taxes.
Revenue Effects	-Continuing By increasing need for repairs as time goes by after $10-20 or $hould, one can make the vehicle DOT is or $5/unit would be true or temporarily. Delay is to necessary fees to state revenues. It the charges can be deferred.
Impacts on Economic Development	No significant impacts are anticipated.
Business & Public Acceptability	These prices levied at economic intermediaries to an extent are will object to industry, less so itself regulation here. Some regular [illegible] taxing may have can be expected to [illegible] although not in an [illegible] manner. Owners can take little steps to be [illegible] to a modest. Cities at more are exploratory ask a [illegible] not all sales [illegible] service will fall.
Implementation	Strong enforcement and administrative structure is considered necessary. Maybe this should not introduce [illegible] problems to [illegible].
Recommendation	Because [illegible] not a new [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] on the [illegible] basis [illegible], it is recommended that [illegible] [illegible] [illegible] [illegible] studies.

Policy Measure: TAX EXEMPTIONS AND INSURANCE SUBSIDIZATION FOR VANPOOLS

Definition		Rebates of state gasoline tax on fuel used for vanpooling to work. Reduction or elimination of sales tax on vehicles used for vanpooling. Property tax waivers for companies acquiring vans for vanpool program. State subsidization of vanpool liability insurance. Designed to encourage the use of ridesharing alternatives for the work trip. Many of these cost subsidization actions have already been implemented in Connecticut.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Longer work trips to major activity centers or large employers. Statewide application with particular emphasis on areas ouside the inner-cities. Commuters who are not currently served adequately by transit.
Travel Impacts	●	A $.70 savings in round trip costs per carpool is estimated to produce a .94% decline in work trip VMT, and an overall net effect on total daily VMT of minus 0.65%.
Emissions Impacts	•	Emissions impacts have been estimated to be 1.91 tons/day for NMHC.
Other Significant Impacts	•	Tax exemptions promoting the use of vanpooling, combined with insurance subsidization and vanpool matching programs, can contribute effectively to fuel conservation goals. The negative safety impacts initially feared have not materialized and vanpools have, in fact, displayed an excellent safety record over the last few years.
Costs-Initial	o	Major costs would include administrative details and the cost of subsidizing vanpool liability insurance. The magnitude of the cost will be determined by the extent of subsidy required.
-Continuing	o	Continuing costs can be expected to be roughly equal to start up costs.
Revenue Effects	○	The major revenue effects will be foregone fuel tax receipts, property tax receipts, and state sale tax. The effect on fuel taxes could be over $2 million a year.
Impacts on Economic Development	●	Ridesharing programs generally enhance the image of the state and its marketability to prospective employers. Measures which particularly subsidize the employers costs will be particularly attractive. By increasing worker mobility, corporations will be able to draw employees from a larger market area.
Business & Public Acceptability	●	Business and public acceptability of ridesharing measures has been good in Connecticut. Further programs which directly subsidize employers costs can be expected to be received positively since they allow the companies to enhance their own image at no or little cost. In addition to a direct subsidy of vanpooling costs, it is also an indirect subsidy of other corporate costs as parking construction can be delayed.
Implementation Issues	o	Implementation issues will vary according to the specific measure under discussion. Rebates on state gasoline taxes have already been implemented as have property tax waivers for companies acquiring vans for vanpooling purposes. Legislation to reduce or eliminate the sales tax on vehicles used for vanpooling has been filed but has not yet been passed. Overall, several legislative hurdles have already been passed which would indicate a positive scenario for future actions.
Recommendations		It is recommended that those measures which have not already been implemented be carried into Phase II. State subsidization of vanpool liability insurance deserves particular attention since it has received relatively less attention to date.

Policy Measure: CARPOOL AND VANPOOLING COST SUBSIDIES

Definition		Toll costs, parking costs, and fuel taxes would be either eliminated or reduced for carpools and/or vanpools.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Work trips Statewide application but will be most effective in dense areas. Employees, currently travelling greater than average distances, using toll roads, and/or paying for parking.
Travel Impacts	•	Savings of $.70 per day per carpool yields a 3.94% reduction in work trip VMT and a 0.65 savings in daily VMT.
Emissions Impacts	•	NMHC emission reductions of 1.91 tons/day are forecast.
Other Significant Impacts	NS	No significant impacts predicted. Some minor safety improvements as work VMT drops and passengers are protected by use of larger vehicles. Possible minor depression of noon hour retail sales in surrounding shopping districts as worker mid-day mobility is decreased.
Costs-Initial -Continuing Revenue Effects	NS NS o	No significant costs are anticipated for this facet of a ride-sharing program. Natural complementary measures would have associated costs. Slight reductions in total state revenues predicted as small percentage of fuel tax and toll receipts are foregone.
Impacts on Economic Development	•	Active programs which provide incentives for experimenting with new ideas which may ultimately prove beneficial to employees can be expected to be a mildly attractive feature to prospective employers and developers.
Business & Public Acceptability	•	General public acceptance should be good, as this is an incentive-based measure. Employers should be basically neutral; may be positive if program is seen as a way to reduce strain on parking facilities.
Implementation	o	Implementation issues should be minor. Tax rebate program may be set up on annual basis. Parking costs may require new receipt validation procedures to be set up. Toll exception may be set up with express lane in areas where highway capacity allows it.
Recommendations		Because pricing subsidies have proven to be implementable within Connecticut and have been shown to produce meaningful positive impacts, it is recommended that such measures be included as an element in the packages of measures to be analyzed during Phase II.

Policy Measure: TAX INCENTIVES FOR EMPLOYER TRANSPORTATION PROGRAMS

Definition		Costs of setting up carpool and vanpool matching programs would be made tax deductible. Complements policy measure of subsidizing vanpool costs.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Work trips. Statewide. Larger employers, generally companies of 150 or more with employees living in sufficient proximity to other employees to make ridesharing viable. Many companies were reluctant to participate in Connecticut's Commuter Incentive Program, and this measure would remove administrative costs as a reason for not providing ridesharing incentives.
Travel Impacts	•	Employer-based ridesharing programs have demonstrated their ability to achieve reductions in VMT by raising auto occupancy.
Emissions Impacts	•	As average auto occupancy, particularly in areas with several large employers, is increased, moderate reductions in NMHC can be anticipated.
Other Significant Impacts	•	Any program inducing higher auto occupancy has potential energy-conserving features. Carpooling or vanpooling schemes providing home-to-work travel have the offsetting factor of daytime use of the autos left home, however.
Costs-Initial	○	Employers may require planning assistance to start programs. Administrative mechanism for validating tax claims required.
-Continuing		Continuing planning costs can be anticipated.
Revenue Effects	○	Total taxes on corporations will decrease as employers apply their program costs as tax deductions or, even more significantly, as tax credits.
Impacts on Economic Development	•	Modest long-term positive effects on Connecticut's competitive position are expected.
Business & Public Acceptability	●	Business and public acceptability should be good as vanpool programs offer employers both direct monetary benefits and the indirect benefit of being able to draw workers from a larger labor market area.
Implementation	NS	No significant implementation issues should be encountered. Legislative changes have already been made to provide a corporate exemption of state income taxes on vans purchased for vanpooling. Further incentives may be provided by allowing credit for spending administrative resources.
Recommendations		It is recommended that employer tax incentives be included for consideration during Phase II. It can stand alone or be successfully combined with a number of other ridesharing incentives.

Policy Measure: HIGH OCCUPANCY VEHICLE PRIORITY LANES

Definition		Reserving the use of selected lanes of the highway system exclusively for buses, vanpools, and carpools carrying three or more persons. Facilities may be contra-flow freeway reserved lanes, physically separated freeway priority lanes, or other mechanisms of giving priority on ramps and freeways.
Target Market Segment - Trip Purpose - Geographic Impact - Trip Purpose		Work trips Relatively large urban areas with highway sections that are subject to regularly recurring congestion. Suburban or rural transit users and ridersharers having relatively long distance commuter trips to the central core of cities.
Travel and Emissions Impacts	● • •	No Connecitcut expressway corridor has the potential for achieving high impacts relative to other US implementation experience. Projects do exist, though, which can produce medium impacts, 10% reduction in autos per person, and low impacts, 5% reduction. Total 1982 daily VMT reduction of 92,300 or 0.18% is estimated.

MEDIUM POTENTIAL:

	I-91 Hartford North	I-84/I-86 Hartford East	I-84 Hartford West	I-95 New Haven East	I-95 New Haven West	I-84 Waterbury
Length	8.6	10.4	9.3	5.5	6.1	8.3
△VMT	12,300	15,200	15,800	6,300	9,500	10,100
△HC Tons/day	.041	.051	.053	.021	.032	.034

LOW POTENTIAL:

	I-91 Hartford South	I-91 New Haven North	I-84 Danbury	Rts. 8/25 Bridgeport	US 7 Norwalk
Length	12.6	6.2	10.2	3.8	--
△VMT	9,500	4,700	5,400	1,800	1,800
△HC Tons/day	.032	.012	.012	.006	.006

Other Significant Impacts	•	Safety impacts of HOV priority lanes have been mixed; take-a-lane projects have resulted in increased accidents while add-a-lane projects have had good safety records. Fuel impacts will be correlated with VMT reductions.
Costs-Initial	○	$2.5-5 million per mile for physicaly separated express lanes. Hartford TRANSPLAN has estimated $10 million per mile or $336 million (1979$) for 6 corridor HOV lane construction program.
-Continuing	○	$4-13 thousand per mile for concurrent-flow; $60-200 thousand per mile for contra-flow.
Revenue Effects	NS	Increased transit and ridesharing utilizaiton will decrease gas tax revenues.
Impacts on Economic Development	•	Systematic implementation of HOV lanes is indicative of good traffic management and, thus, can help promote Connecticut as a progressive state.
Business & Public Acceptability	●	Past experience has been mixed, dependent on the type of priority treatment utilized. Take a lane projects have proven to be highly controversial, while reaction to other types of HOV projects generally has been positive.
Implementation Issues	○	Implementation may be difficult in certain corridors because of existing ramp configurations. Examples are I-84 west of Hartford, I-95 east of New Haven and I-84 in Danbury. Enforcement can be both difficult and costly in some cases. Implementation requires a relatively high level of inter-agency coordination.
Recommendations		Development of HOV priority lanes in major urban corridors will yield small but nonetheless positive reductions in statewide NMHC emissions. Implementation, however, may be both costly (compared to other measures) and, in some cases, difficult. The largest potential exists in the Hartford area, and on selected corridors in New Haven and Waterbury. It is recommended that implementation of the five "medium impact" projects be assumed as part of the Phase II analysis of alternative packages.

Policy Measure: PARK-AND-RIDE LOTS

Definition		Increase the numbers of carpool, vanpool, express bus, and rail station lots. Acting on a mandate from the State Legislature (1970), ConnDOT now operates 123 of these lots. Emphasis would be placed on providing vanpool service in areas where it would not conflict with transit.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Primarily work trips Urand and suburban areas. Commuters having longer than average commute distances.
Travel Impacts	•	A statewide peak hour VMT reduction of 1.5% and all day reduction of .6% are expected.
Emissions Impacts	•	A statewide emissions reduction of .412 tons/day has been estimated. Percentage emission reductions generally are less than VMT reductions because the cold-start portion of automobile access trips still occurs.
Other Significant Impacts	●	Reduced highway congestion and noise pollution, and increased energy conservation are indirect benefits. Expanded access for employees to employment centers and reduced expenditures on parking facilities at employment centers are anticipated benefits.
Costs-Initial	O	Capital costs for parking spaces vary by construction technique, but average $2,000 per space.
-Continuing	o	Maintenance costs have been estimated at roughly $40 per space.
Revenue Effects	NS	All present lots are free. Therefore, no significant revenue potential exists unless the state decides to control parking for both safety and revenue reasons and charges for permits.
Impacts on Economic Development	●	Increasing park-and-ride trips will increase the viability of Connecticut's current residential patterns and labor market configurations, making the State attractive to businesses and developers.
Business & Public Acceptability	●	Parking lot programs have enjoyed strong support and are expected to continue to be highly acceptable. Users have been receptive to the lots currently in use, incorporating them into carpool and vanpool arrangements. The only exception has been in areas where the state has licensed, rather than constructed space, and conflicting demands for parking space have arisen.
Implementation	o	Basic implementation issues are not expected to be problems since parking lots of this type are not a new or untested idea in Connecticut. Issues which may arise are the extent of the burden on State revenues and the total level of expansion which is desirable.
Recommendations		It is recommended that the option of increasing the number of park-and-ride lots be included in Phase II analysis. This is consistent both with existing state policy and the further gains anticipated from this measure. It must be recognized that the potential additional emission reductions are less significant than for some measures due to the degree of market penetration which has already been achieved. Such lots, however, contribute positively to other measures such as carpooling, vanpooling and transit.

Policy Measure: CARPOOLING

Definition		A type of ridesharing activity utilizing normal passenger automobiles as the vehicle. These autos are generally owned and operated by members of the pool. Members generally either rotate driving to distribute costs or pay a designated driver for the service. Carpooling is currently very active in Connecticut , particularly among state employees. Carpool matching activities exist at the state level and are being developed by non-profit ridesharing corporations in Hartford and Fairfield counties.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Work trips primarily; some school trips may be targeted. Statewide application appropriate. Commuters, particularly those with a moderate to long journey to work, with a sufficient clustering of origins and destinations to facilitate matching.
Travel Impacts	●	Assuming implementation as part of a broader ridesharing program, an increase in the current 20% modal share for all types of ridesharing will enable Connecticut to show a marginal gain of 8% in carpooling, bringing the carpool share to 28% and the work trip VMT decrease attributable to ridesharing to 6.0 percent. If only employer-based carpooling is implemented (without vanpooling), a decrease in work trip VMT of 1.25 percent is estimated.
Emissions Impacts	●	If only an employer-based carpool matching and promotion program is implemented, a decrease in NMHC emissions of 1.27 tons/day is forecast.
Other Significant Impacts	•	Fuel cost savings have been a major marketing point in carpool promotion and while they are not necessarily commensurate with emissions reductions they are still high.
Costs-Initial	o	FHWA (1978) carpool analysis recommended per capital expenditues of $.30 to $.10 with cost decreasing as urban area size increased from below 1/2 to over 1 1/2 million population.
-Continuing	o	For planning purposes, annual operating and maintenance costs can be assumed to be roughly equivalent to start up costs.
Revenue Effects	o	Foregone gasoline fuel tax receipts will dominate the losses to state revenue engendered by increased ridesharing activity. An annual loss of $2.6 million has been estimated.
Impacts on Economic Development	●	Carpooling programs, particularly those which solicit employer participation, make the state a more attractive location choice. Workers are attracted by increased mobility and companies by the opportunity to decrease their costs and enhance their image simultaneously.
Business & Public Acceptability	●	Attempts to change Connecticut Commuter Incentive Plan (CIP) from a voluntary program to a program requiring employers of 150 or more to participate in the active promotion of rideshaing activities among their employees have been actively resisted, and the CIP itself has been recently terminated. There are, however, numerous examples of private initiatives within the State.
Implementation Isaues	•	Implementation of additional or intensified carpooling programs is expected to not meet with resistance. Connecticut is already a nationally recognized leader in ridesharing activities. A major creative effort will be required to deal with some of the remaining operational issues, such as the social aspects of carpooling, however.
Recommendations		Carpooling is sufficiently proven in Connecticut that it should be carried into Phase II for further analysis. Carpooling incentives, though, should be considered for coordinated implementation with other actions such as vanpooling and vanpool brokerage, HOV lanes, marketing, and cost reductions if its full potential is to be recognized.

Policy Measure: VANPOOLING AND VANPOOL BROKERAGE

Definition		A type of ridesharing activity which utilizes passenger vans, typically capable of carrying 12 to 16 passengers as the basic vehicle. Vanpooling actions can include a number of cost subsidizations (discussed separately), passenger matching programs and operational aids (group acquisition of vans, etc.). Connecticut, currently, is a leader in the country in the diversity and extent of its vanpooling programs. Five specific options are: (1) vanpool assistance to private employers in urbanized areas, (2) and in non-urbanized areas, (3) state employees vanpooling programs, (4) the deregulation on vanpools, and (5) the provision of vanpool brokerage services throughout the state.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Primarily work trips. Statewide application appropriate, through primarily in urban and suburban areas. Commuters, particularly those with long trips (average distance to work for vanpools exceeds that of carpools) and working for large employers (150+) or at major activity centers. Vanpool brokerage would extend the availability of vanpooling to employees of mid-size and small firms.
Travel Impacts	●	A comprehensive employer-based ridesharing program, including vanpooling, is estimated to reduce work trip VMT by 6 percent. Extending this to include vanpool brokerage would increase its effectiveness by about 50 percent, yielding a 9 percent savings in work trip VMT.
Emissions Impacts	●	Base emissions reductions of 4.24 tons/day are estimated for the comprehensive employer-based ride-sharing program. About .70 percent of this results from vanpooling. Extending the program to include a vanpool brokerage would increase emission reductions to 6.4 tons/day for NMHC.
Other Significant Impacts	●	Vanpooling has been shown to be very energy efficient using approximately 2,420 BTU's per occupant as opposed to 14,220 for drive alone vehicles. In this way it contributes effectively to state energy conservation needs. Nevertheless, the average percentage decrease in areawide fuel consumption will be less than the average decrease in VMT because it affects longer, more energy efficient trip making. Vanpools have had excellent safety records.
Costs-Initial	o	The Greater Hartford Ridesharing Corp. (serving an area of .7 million) has an initial budget of $430,000.
-Continuing	o	Continuing costs will be approximately equal to start up costs.
Revenue Effects	o	Increased ridesharing is expected to decrease daily gas tax revenues by $10,364 or on an annual basis by $2.6 million.
Impacts on Economic Development	●	Vanpooling and other incentives to ridesharing, enhance the state's image and make it a more attractive choice to both potential employers and employees. It provides the state an image of preparedness which would indicate an ability to cope successfully with future energy crises.
Business & Public Acceptability	•	Ridesharing activities have received wide support in Connecticut and active participation by many employers in the private sector. However, only 4% of employers have taken advantage of ConnDOT's ridesharing services. While reaction has been mixed, little outright opposition has been encountered in the case of voluntary participation. This can be anticipated to change if participation become mandatory.
Implementation Issues	o	Since a number of the institutional problems surrounding vanpooling have already been overcome in Connecticut, many of the hurdles to implementation are behind the state. The remaining barriers revolve around procedures to increase employer and employee participation rates.
Recommendations		Specific measures which make vanpooling more widely available or less costly are beneficial and can proceed both with implementation and as part of the integrated packages of measures to be analyzed during Phase II. Because of its ability to make vanpooling more effective by cutting down the critical employer size, third party vanpooling at multiple employer activity centers deserves particular consideration. The state employee vanpool and carpool programs will not of themselves make significant contributions to air quality because of the limited number of employees affected; they will, however, serve as important leadership activities for the state.

Definition		Conditions for bicycling can be improved by: 1) the construction or setting aside of facilities for bicycle use from unprotected bike lanes to exclusive bike paths and bike parking facilities; 2) operational improvements using traffic system control, etc.; and 3) public awareness programs to educate both drivers and bicyclists.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		All trip purposes impacted, though "purposeful" trips are usually the target for air quality purposes. Urban or suburban locations most effective application, particularly trips six miles or less in length. Very young can have increased mobility; elderly not impacted
Travel Impacts	•	Daily VMT reductions of .13% are expected from an ambitious program.
Emissions Impacts	•	Emissions reductions of less than 0.25% or .224 tons/day of NMHC are anticipated.
Other Significant Impacts	•	Corresponding gains in fuel conservation can be expected to accompany the shift away from autos. Positive health benefits will be received by people who use an active mode of transport, but negative health impacts may occur in areas where, through proximity, bicyclists ingest fuel emissions from automobiles. Safety will be an issue unless facilities are well designed.
Costs-Initial -Continuing	o o	Unless a program to build exclusive bike paths (at a cost of $30,000-$120,000/mile) is undertaken, program costs, facility changes, and traffic control system change costs can be expected to be relatively modest. Continuing costs will be a factor where bicycles are registered, education programs administered, and bicycle paths (and lanes) must be maintained.
Revenue Effects	•	Revenue from bicycle licensing activities may be sufficient to offset some program costs.
Impacts on Economic Development	NS	No significant impacts on economic development are expected because of the limited nature of the sector of the population to whom bicycling is an important issue.
Business & Public Acceptability	●	Activities to improve bicycling conditions are generally popular, particularly when action is taken to separate bicycles from other traffic and safety improvements are perceived. Negative reactions from the private sector may occur if parking or traffic lanes are restricted to provide space.
Implementation Issues	○	Bicycle security and vandalism control are critical to a successful program. Safety is always an issue when bicycles, pedestrians, and autos mix and requires careful consideration. Jurisdictional conflicts may arise as local municipal officals resist changes to their traffic systems.
Recommendations		It is recommended that additional analysis of bicycling is not necessary as part of the Phase II investigation of alternative packages of measures, but that individual projects proposed be analyzed on a case-by-case basis.

Policy Measure: INCREASED TRUCK SIZE AND WEIGHT LIMITS

Definition		Increase the maximum weight and length restrictions on trucks from 73,280 lbs and 55 feet to 84,000 lbs and 65 feet thereby raising Connecticut's limits to both Federal standards and those of most other states.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		All heavy duty truck trips Statewide All trucking companies (including owner operators) operating heavy-duty vehicles.
Travel Impacts	•	An approximate reduction of 1% of total truck-miles or 1/10% of total VMT in Connecticut can be expected. This represents a savings of approximately 20 million truck miles per year.
Emissions Impacts	•	NHMC emission reductions of .1% or .424 tons/day can be expected. Some reductions in the nitrous oxides and formaldehyde emitted by diesel engines could also be anticipated.
Other Significant Impacts	NS	Fuel use may decrease slightly due to increased efficiency of truck movements (assuming the percentage of empty or partially filled back hauls does not increase). Accident reductions due to lower total VMT may be off-set with the higher incidence of accidents associated with heavier trucks (and particularly double bottoms).
Costs - Initial	◯	Selected highways and bridges may need to be upgraded to safely and effectively support the increased loading.
- Continuing	o	Higher maintenance costs can be anticipated as pavement deteriorates more quickly from wear.
Revenue Effects	NS	No significant impact on revenue is expected from this measure alone.
Impacts on Economic Development	•	Small positive impacts can be expected as a more favorable environment for goods movement is created. Increasing truck capacity and reducing the per unit labor costs will allow goods to move more effectively and efficiently.
Business and Public Acceptability	• ↓ o	While the public is generally concerned over issues of safety, overall reaction can be expected to be quite neutral. While benefitting shippers will be receptive, certain sectors may object on the grounds that traffic will be diverted from rail.
Implementation Issues	NS	Legislative action would be required to raise the limits on State primary and secondary highways. Uniform implementation of comparable legislation by surrounding states would make the program more effective. Enforcement mechanisms are already in place, as are the administrative structures necessary to raise user's fees.
Recommendations		While there is a conflict between this policy measure and those focused on rail, it is felt that the impacts of this measure are sufficient to carry it over into Phase II. Even though the actual reductions anticipated are small relative to those which are auto-oriented, it may prove important to the public sector in order to encourage participation and cooperation.

Policy Measure: HIGHWAY COST ALLOCATION

Definition		Increase the proportion of motor vehicle revenues drawn from trucks from 36% (current) to 40%. This assumes that the inclusion of common costs in truck user fees can be justified and that trucks should bear more than the 36% of highway costs which can be directly allocated to them.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		All truck travel Statewide All trucks in Connecticut which are subject to motor carrier road taxes, fuel taxes, and registration fees.
Travel Impacts	●	It has been estimated that a 20% increase in truck user fees will induce a 2% decrease in total truck miles in Connecticut or decrease total VMT by 2/10 of a percent. This is equivalent to a decrease of approximately 40 million truck miles annually.
Emissions Impacts	●	NMHC reductions of approximately .847 tons/day at a minimum can be expected. Additional reductions may occur as a result of increased load factors.
Other Significant Impacts	●	Reductions in total gasoline and diesel fuel consumption in heavy-duty vehicles should be commensurate with VMT savings. Beneficial secondary effects on safety may also be anticipated as truck miles decrease.
Costs - Initial - Continuing Revenue Effects	NS NS ●	Few additional costs will be incurred by the State as the necessary administrative structure and enforcement mechanisms are already in place. Increases in revenues could be significant.
Impacts on Economic Development	NS	No significant negative impacts on Connecticut's economic development are expected. Increasing truck costs should result in both some greater efficiency in truck movements and some small percentage shift to rail and air freight.
Business and Public Acceptability	● ↓ ○	Public reaction may be expected to be mildly favorable as highway costs are reallocated in their favor. Trucking companies will oppose the increase unless it is coupled with legislation which they can support such as increased size and weight limits.
Implementation Issues	○	Legislative action is required to change truck fees but subsequent implementation steps are straightforward.
Recommendations:		Further analysis of state highway maintenance needs, alternate funding sources and impacts on modal shares appear warranted before this policy measure can be recommended for implementation. It has sufficient potential to be carried into Phase II, however, particularly as an element in a goods movement rationalization package.

Policy Measure: TRUCK RATE AND SERVICE DEREGULATION

Definition		Deregulate all trucking in Connecticut which is beyond the jurisdiction of the Interstate Commerce Commission. Currently the Department of Public Utilities Control (DPUC) regulates movement in all but certain areas which are generally exempt as a matter of a historic precedent based on rail operations.
Target Market Segment - Trip Purpose - Geographic Input - Special Groups		Truck trips not regulated by ICC. Statewide All trucks whose operations are based in Connecticut and whose movements are not regulated by the ICC would be affected.
Travel Impacts	-	There has been no clear evidence to date on the effect of rate deregulation on either rates or total truck miles. Should rates drop substantially, some shift away from rail freight can be assumed.
Emissions Impacts	-	Because the evidence for impacts on rates and modal shares has been unclear, no definitive analysis of emission rates can be done at this time either.
Other Significant Impacts	● ↓ o	Some studies have predicted fuel savings, but others have predicted shifts from rail to truck which would give rise to 1 to 6% increases in truck fuel use. The measure might also hurt the economic viability of some rail freight services in Connecticut.
Cost - Initial - Continuing	NS NS	No significant costs to the State would be incurred by the implementation and enforcement of such a measure.
Revenue Effects	NS	None
Impacts on Economic Development	●	Current sentiment in the industry favors deregulation to the greatest extent possible. Arguments are made that a healthier environment for competition would be created. Should this prove true, lower rates and more extensive and efficient trucking can be anticipated. Evidence from similar actions in other states, however, has proven to be mixed.
Business and Public Acceptability	● ↓ o	There is broad public sentiment for deregulation of transportation industries currently and the majority of larger trucking companies can be expected to support such a change. Small operators and railroads may be expected to contest the deregulation quite strongly.
Implementation Issues	o	Legislative action will be required to change the jurisdiction of DPUC. Beyond that implementation problems should be minimal.
Recommendations:		This policy may have negative implications for Connecticut's policy of balanced transportation unless it is pursued in concert with rail rate deregulation. Because of the potential for promoting more efficient and competitive goods movement it is recommended that the policy be carried over for further consideration into Phase II as part of an inter-city truck package of measures.

Policy Measure: TRUCK EMISSION STANDARDS

Definition		Establish a series of emission standards for heavy duty vehicles registered in Connecticut. Rigorous enforcement using an inspection and maintenance program would be critical. A light-duty vehicle I/M program is currently being implemented by the Connecticut Department of Environmental Protection.
Target Market Segment - Trip purpose - Geographic - Special Groups		All heavy-duty truck trips Statewide All heavy-duty vehicles will potentially be affected by this program. Trucks with gasoline engines, which deteriorate with age and usage, will be more seriously impacted than diesel powered vehicles.
Travel Impacts	NS	No major changes in travel patterns, load factors, or modal shifts is anticipated as a result of this policy action.
Emissions Impacts	●	If a schedule of standards is set up which (with meaningful fines and rigorous enforcement) is capable of reducing total truck emissions by 20% or total emissions by 2%, a savings of approximately 2,500 tons of NMHC could be achieved annually.
Other Significant Impacts	NS	No significant impacts, other than those on emissions, are expected as a result of this policy action.
Costs - Initial	O	Significant intial costs are anticipated as emission monitoring equipment must be acquired and testing centers set up state-wide.
- Continuing	o	Continuing costs will be composed of running testing centers and program enforement.
Revenue Effects	•	The state may be able to derive some revenue from testing fees and from increased user licensing fees.
Impacts on Economic Development	•	Short-term hardship may be experienced by trucking companies who will have to repair or replace their current vehicle stock. Long-term effects will depend on the extent to which other states implement similar programs.
Business and Public Acceptability	● ▼ O	General public support can be expected for measures which distribute the burden of meeting Federal air quality standards. Truck companies are likely to be strongly opposed.
Implementation Issues	O	Implementation of this policy measure will to be difficult. Initial legislation will be opposed by those most affected. Setting up testing centers will require the creation of a new administrative structure if the trucks cannot be handled by centers expected to be set up for passenger vehicles.
Recommendations		Because of the projected degree of implementation difficulty and cost relative to the expected benefits, it is recommended that additional analysis of this measure not be performed during Phase II.

Policy Measure: LIGHT DENSITY RAIL LINE ABANDONMENT

Definition		State would continue the current policy of preventing the abandonment of light density rail lines in Connecticut to protect those lines not covered by the Conrail Final System Plan. ConnDOT has spent a total of $5.2 million on such actions since 1976.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		All trips on light density lines Statewide, but primarily in rural areas Operators currently considering abandonment of lines and operators who might use recently abandoned lines if they could be made financially viable.
Travel Impacts	-	No quantitative analysis of the change in modal share as a result of this policy action has been made to date. Even if there was no shift, the program would help to curtail the trend of rail-to-truck diversion.
Emissions Impacts	NS	Emission reductions should result, but will be relatively small since any modal shift is expected to be minimal and only a relatively small percent of total freight movements would be affected.
Other Significant	NS	Any increase in rail mode share will result in some positive impacts on safety, fuel use, and highway maintenance.
Costs - Initial	◯	The initial cost of purchasing new lines tends to be substantial. ConnDOT has spent $2.1 million on this activity in the last four years.
- Continuing	O	The continuing costs of maintaining lines and improving services will be significant: ConnDOT has spent $1.4 and $1.7 million respectively on these activities since 1976.
Revenue Effects		There might be secondary effects with positive revenue potential if new industry is attracted into the state, but economic impacts of this measure in other states have been mixed.
Impacts on Economic Development	•	By supporting the continuing existence of an extensive rail network in Connecticut, the State's competitive position, particularly in regards to manufacturing industries will be protected and may well grow stronger over time as energy supplies dwindle.
Business and Public Acceptability	•	Public support of the continuation of rail service throughout the state is high (although the particular focus has been on passenger service) and is expected to remain so unless tax increases become acceptable. General support by business is expected.
Implementation Issues	NS	Since this policy action is already an ongoing aspect of ConnDOT's work, no significant implementation problems are expected. Renewal of federal aid beyond 1980 is contingent on success and viability, however.
Recommendations		Because this is a policy which the State is already pursuing, additional analysis is not required as a part of Phase II.

Policy Measure: RAIL INTERMODAL TRANSPORTATION

Definition		Increase use of both container-on-flatcar (COFC) and trailer-on-flatcar (TOFC) services. Both of these services support rail/truck intermodal service; COFC can also serve air and water operations, and TOFC can be used for services involving water transport.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Truck freight Statewide Containerized freight services serve industries interested in reducing loss-and-damage rates and in providing good distribution and collection service with the economy of certain line haul services. Given Connecticut's predominance of high value manufacturing, such service is compatible with the product mix.
Travel Impacts	•	Travel impacts on freight movements could be significant by inducing more efficient routing than currently exists (via NYC rather via Albany shipping) and thereby reducing circuity for mid-Altantic traffic. By reducing route-miles, reliability could be increased and a modal shift induced.
Emissions Impacts	•	While emission reductions have not been quantified, they would derive from two sources: the cumulative decrease in rail miles and the decrease in truck miles due to modal shifts. These shifts would probably not require additional miles to be travelled by rail locomotives since train length could be increased in most cases.
Other Significant Impacts	○	With the diversion of truck traffic to rail and water, gaoline and diesel fuel use and truck-related highway accidents can be expected to decline. Additionally, highway maintenance costs directly attributable to trucks can be expected to decrease slightly. Finally, diversions would help to strengthen two industries (rail and shipping) whose market share has been decreasing over time.
Costs-Initial	◯	Equipment costs will be high, up to $10 million, if ConnDOT decides to take responsibility for providing intermodal facilities and/or for sponsoring a very large demonstration.
-Continuing	o	Continuing subsidies and administrative support would probably be required for the first few years of a demonstration.
Revenue Effects	●	Some revenue could be derived from usage fees charged at state sponsored facilities.
Impacts on Economic Development	•	By offering a higher level of service and/or better ton-mile rate, Connecticut's transportation industry would be in a strong position for supporting efforts of the Dept. of Economic Development.
Business and Public Acceptability	NS	Public and business acceptability can be expected to be good, unless the state funding commitment is perceived to be an excessive burden.
Implementation Issues	o	The time required to design, build, and put an intermodal facility into operation would be significant. ConnDOT will then also have to decide whether to operate these services or to contract them out.
Recommendations		It is recommended that this policy not be analyzed further in Phase II. While containerization is an interesting and promising innovation in freight movement, expected contributions to air quality are not expected to be sufficiently large compared to the anticipated implementation costs to justify these improvements on only air quality grounds.

Policy Measure: INTERCITY RAIL RATE DEREGULATION

Definition		Deregulation of rail rates and services for intrastate movements to complement interstate deregulation. ICC and ConnDOT currently regulate intrastate activities. State regulation, however, is less than in the case of trucking.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		 All rail freight Statewide All carriers carrying intrastate shipments. Intrastate shipments are defined as those which originate, terminate, or move completely within the state.
Travel Impacts	NS	No substantial impacts are anticipated beyond a slight decrease in locomotive miles due to marginally improved tons/train loadings
Emissions Impacts	NS	Small short-term emission impacts are anticipated. Long-term modal shifts away from rail may be successfully curtailed with favorable impacts on future emissions levels.
Other Significant Impacts	•	Moderate decreases in rail rates may occur; environment will not be as competitive as for trucking, however, given that their are fewer carriers. Truck VMT and accidents may stablize somewhat as a result of dampening modal shifts.
Costs - Initial	NS	No significant costs anticipated.
- Continuing	NS	
Revenue Effects	•	Positive revenue effects from taxes on higher rail revenues.
Impacts on Economic Development	NS	No significant impacts on economic development are expected in the short term. Over the long term, by stabilizing the rail industry in Connecticut, there may be moderate benefits for industry.
Business and Public Acceptability	•	Public acceptability of deregulation is good. Trucking industries can be expected to oppose rail deregulation. Some shippers may oppose it as their rates are driven down; overall, however, business support can be expected.
Implementation Issues	○	Deregulation of one mode in a competitive environment would probably be difficult. Viable implementation plans would require similar plans for trucking. Enforcement problems would not be an issue.
Recommendations		It is recommended that rail rate and service deregulation not be analyzed further in Phase II since it promises to contribute little in the near term to solving Connecticut's air quality problems.

Policy Measure: CONSOLIDATION OF URBAN GOODS TERMINALS AND OPERATIONS

Definition		The consolidation of truck, and possibly rail, terminals to increase vehicle loads. While such actions have not been publicly initiated on a major scale in Connecticut to date, State regulatory powers and fiscal powers make it a desirable participant.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Urban freight Urban areas Urban freight carriers, receivers, and shippers. Particularly shippers who generate a high proportion of LTL (less than truckload) and PTL (part-truckload) shipments. Such shipments require efficient processing in order to move quickly and yet be profitable for the carrier.
Travel Impacts	NS	Only minimal VMT reductions are expected. Some savings will occur from increased distribution and collection efficiency, but there also will be some decrease in VOM (Vehicle Operating Minutes).
Emissions Impacts	•	Emission reduction potential is difficult to estimate based on the amount of data currently available in Connecticut. Primary savings would be gained from reduced vehicle idling time, and possibly from decreased urban congestion as well.
Other Significant Impacts	●	The reduction of double-parked trucks will improve driver and pedestrian safety by increasing visibility for both parties. Urban conflicts between transit vehicles and trucks will be ameliorated. Aesthetics will be improved as lay-bys, loading docks, and truck parking is rationalized.
Costs - Initial	O	Should the State decide to subsidize this concept by constructing the initial facilities, moderate costs can be anticipated.
- Continuing	o	Continuing costs for maintenance and operations can be expected for State-managed facilities.
Revenue Effects	•	User charges levied against shippers and/or carriers are a viable source of revenue for the State.
Impacts on Economic Development	•	Efficient movement of LTL and PTL shipments will support an atmosphere favorable to manufacturing and wholesale operations. Because Connecticut does relatively little heavy manufacturing, sophisticated pre-processed inputs are often required. Efficient distribution is as important as efficient collection.
Business and Public Acceptability	• ↓ O	Business acceptability is expected to be guarded but positive. Public acceptability should be good because of the positive secondary effects on urban congestion. Some small businesses may resist fearing inadequate treatment at large terminals. Carriers resist non-subsidized demonstrations due to risk.
Implementation Issues	NS	No significant problems are anticipated after funds are allocated by the legislature for the project. Careful site selection will be required in order to avoid suits by competing operations. Enforcement of prohibitions on street loading will be required. Should not be a problem if terminal proves advantageous.
Recommendations		Lack of needed data prevents the inclusion of consolidated freight terminals in a Phase II analysis.

Policy Measure: MARKETING, PROMOTION, AND PUBLIC INFORMATION PROGRAMS

Definition		Marketing, promotion and public information programs can be conducted either independently or in conjunction with other policy measures to support the goals of those measures . Information can be oriented towards specific modes--such as transit, carpooling, or vanpooling--or more broadly oriented to the effects of individual decisions on air quality and fuel consumption.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		Can be directed towards all trip purposes, but primary orientation is work trips. Statewide Better transit information, etc. While helpful to all groups, may be particularly valuable for those whose mobility is restricted including the poor, the young, and the old.
Travel Impacts	•	Transportation-related marketing and promotional campaigns have been shown to be relatively ineffective when implemented in isolation. At the same time, marketing programs have the ability to make positive contributions to almost all other measures which are aimed at changing transportation levels-of-service.
Emissions Impacts	•	Same as for travel impacts.
Other Significant Impacts	●	Since marketing can be used to support both transit and ridesharing programs, it will contribute to reduced peak period congestion, reduction of parking demand, improved traffic safety, improved accessibility to employment centers, and improved revenue situations for transit oprators. Fuel conservation goals will also be aided.
Costs-Initial -Continuing	o o	No unit cost estimates are made, since the programs in order to be effective will have to vary widely in their content and scope. UMTA suggests budgeting 2% of revenues for marketing transit activities.
Revenue Effects	•	Increased revenue will be generated by increased transit ridership, but will be offset partially by lost fuel tax receipts.
Impacts on Economic Development	•	By making information readily available, the State's image may be enhanced and economic development supported.
Business & Public Acceptability	NS	No significant problems are anticipated in the implementation of marketing programs. Marketing programs, however, are most effective when focussed on an appropriate market segment.
Implementation Issues	NS	Since several marketing programs are already underway in the State, implementation of additional programs should be relatively straightforward.
Recommendations		It is recommended that independent marketing programs not be considered separately for analysis during Phase II, but integrated as a critical component into those measures retained. Marketing is often a valuable use of resources, but it is complementary in its nature.

Policy Measure: TRAFFIC SIGNAL SYSTEM IMPROVEMENTS

Definition		Coordinated areawide improvement of traffic signal systems based on signal interconnection, optimization of signal timing parameters (cycles, splits and offsets), or advanced computer control. Such a program would complement current efforts to eliminate CO hot spots.
Target Market Segment - Trip Purpose - Geographic Impact - Trip Purpose		All trip purposes throughout the day Urban and suburban areas Travel on non-expressways which are signalized.
Travel Impacts	●	Areawide travel time improvements on the order of 10% are possible within urbanized areas. Potential for a small amount of induced travel.
Emissions Impacts	●	NMHC emissions could be reduced by about 5% witin urbanized areas and 2 1/2% on a statewide basis. This is equivalent to approximately 1.76 tons/day.
Other Significant Impacts	●	Fuel consumption improvements will be somewhat less than half of the emissions reductions, or somewhat over 1% on a statewide basis. Safety also will be enhanced, and certain bus travel times may be decreased.
Costs-Initial	o	$4 million per year for implementation
-Continuing	o	$4 million per year for updating, operations, and maintenance
Revenue Effects	NS	Funding would involve both state and local governments.
Impacts on Economic Development	NS	No significant effect is anticipated.
Business & Public Acceptability	●	Traffic flow improvements generally are widely supported. Certain groups, however, may feel that such measures may increase rather than decrease emissions because of the induced highway travel.
Implementation Issues	o	Implementation responsibility would be shared by state and local jurisdictions. Local areas, though, may lack both necessary personnel and budget resources. Will require close coordination between adjacent municipalities, and between individual municipalities and the state.
Recommendations		Anticipated emission reductions resulting from improved travel times are not offset by the relatively small amount of induced non-expressway travel. Consequently, it is recommended that areawide traffic signal system improvements be analyzed as a part of Phase II.

Policy Measure: TWO-DAY-A-WEEK RETAIL CLOSING

Definition		The mandatory reduction of retail activities for two days a week, with the most viable restriction being a complete Sunday and Monday retail store closing.
Target Market Segment - Trip Purpose - Geographic Impact - Special Groups		 Primary shopping, plus work trip for retail employees Statewide, though primary impact would be in suburban areas Shoppers, retailers
Travel Impacts	•	The majority of shopping trips are made with the objective of making a specific purchase, and these will shift to another day. Travel reductions will arise from a decrease in employee trips and some reduction in the number of shopping trips which are made primarily for purposes of diversion or recreation. Average daily VMT would be decreased by .14%.
Emissions Impacts	•	NMHC emissions would be reduced by .26 tons/day or .08%.
Other Significant Impacts	•	Only very minimal, less than 1%, decreases in retail sales might occur, based on data on Connecticut's retail activities before and after the Sunday ban was lifted. Some marginal fuel savings will appear as the propensity of consumers to arrange tours to effectively fit the same number of activities into less time increases. Some shifting of shopping from suburban to downtown stores.
Costs-Initial	NS	No significant costs are anticipated.
-Continuing	NS	Enforcement should be straightforward and not require additional person-hours. Fines may be set high enough to deter repeat violations and to cover costs.
Revenue Effects	o	Connecticut will lose the tax receipts on goods either not purchased or purchased outside the state because of the two-day Connecticut closing. Otherwise, the majority of consumer expenditure will be shifted to another day of the week or another sector.
Impacts on Economic Development	NS	This measure will not promote an atmosphere conducive to commercial activities. Even if only retail activities are controlled, wholesale, service, and manufacturing industries may fear intervention and alter location decisions accordingly.
Business & Public Acceptability	o ↓ •	The public generally supports a 7-day opening and could be expected to oppose attempts to limit store hours. Large stores with suburban locations favor a 7-day week, while many smaller stores would prefer a shorter operating week.
Implementation	○	Based on previous experience, opposition to the necessary legislative changes can be anticipated. Enforcement of such a measure can be supported by fines.
Recommendations		Given the relatively small emissions reductions which would be obtained in non-peak pollution periods, it is recommended that this measure not be analyzed in more detail as a part of Phase II.

V. Summary of Findings

Evaluation Context

The impact analyses performed to date provide a basis for identifying those measures or policies which have the best probability of contributing effectively to a meaningful reduction of Connecticut HC emissions, yet can be implemented within a reasonable economic, social and political cost. During the next phase of the project, integrated "packages" combining one or more individual measures will be analyzed. While the general purpose of this second phase is to develop greater detail than has been possible during Phase I, four specific kinds of activities can be undertaken:

- more detailed design and analysis of individual measures; for example, determining the maximum desirable limit for expanding the state's park-and-ride program.
- more detailed assessments of particular impacts; for example, examining potential impacts on business, industry, and development.
- prioritization of proposed actions of a given type into a multi-year implementation program; for example, development of a prioritized list of candidate bicycle improvement projects.
- analysis of alternative packages; for example, combining several employer-based ridesharing and transit improvement activities.

The approach to evaluating the individual measures examined during Phase I can be summarized as follows:

- assess the measures on the basis of specific impacts; e.g., emissions reduction potential.
- view the actions from the perspective of specific geographic areas and population groups.
- develop an assessment by individual measure assessing its overall desirability, feasibility and equity.
- examining all the actions, estimate the probability of achieving by 1987 a total 10 percent reduction in 1976 NMHC emissions.
- recommend specific measures and impact analyses to be included as a part of Phase II.

Conclusions

The individual measure summary sheets provided as Chapter IV included a graphic key indicating both the magnitude and the nature (positive/negative) of nine important impacts for each measure. These graphic keys are combined in Figure 4, providing a means of quickly and easily scanning (on a single page) all important impacts and measures. This same information is summarized by potential emissions reduction in Tables 7, 8, and 9. Table 7 examines potential implementation "cost" where cost includes capital and continuing financial resources as well as the effort required to overcome other possible implementation barriers. A low emissions reduction is defined as being under a 1 percent decrease; modest reductions correspond to a 1-3 percent change; and a high reduction is likely to produce more than a 3 percent reduction. Table 8 is structured in a similar manner to Table 7, but tabulates the

FIGURE 4: Impact Summary by Transportation-Air Quality Measure

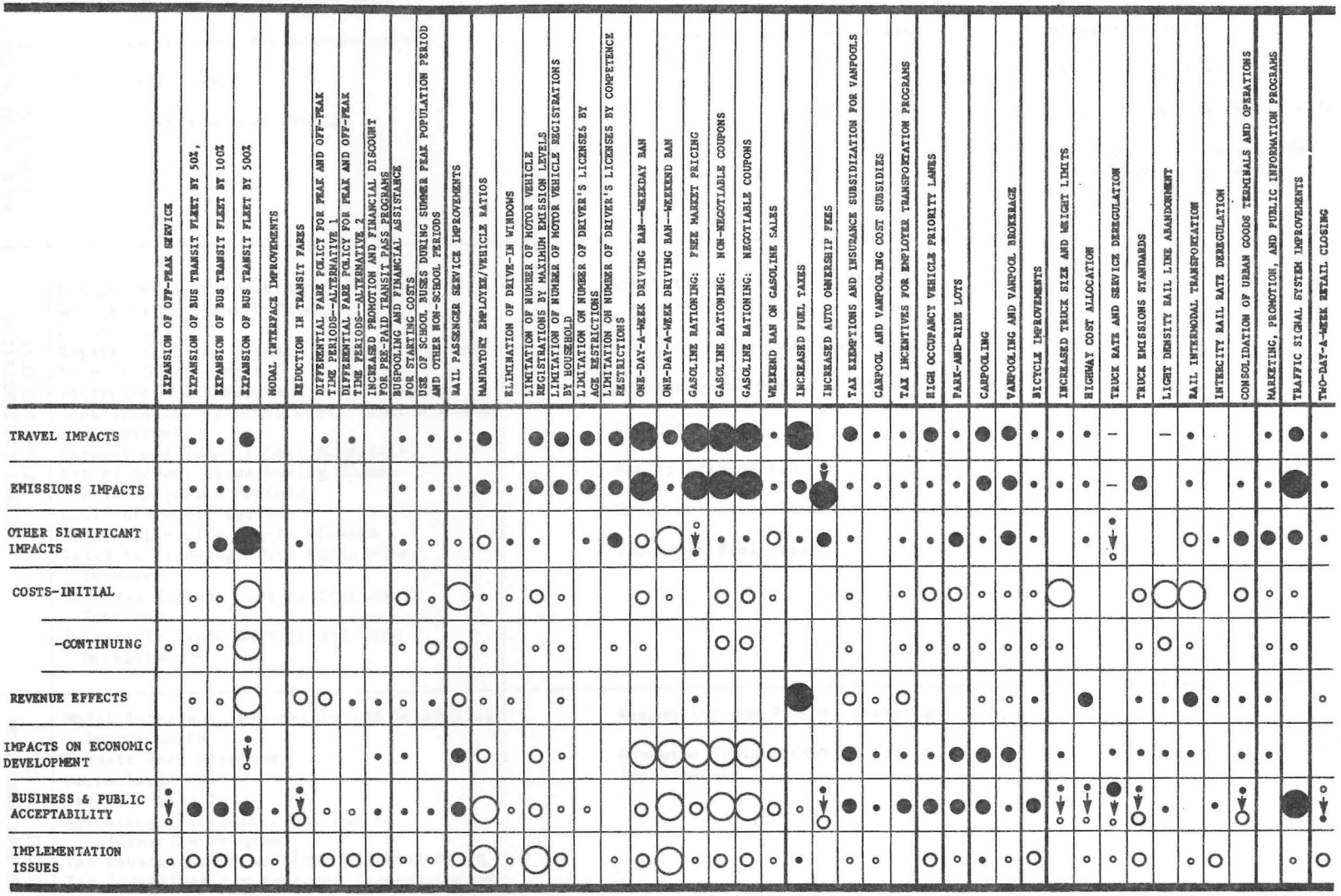
EXPANSION OF OFF-PEAK SERVICE
EXPANSION OF BUS TRANSIT FLEET BY 50%
EXPANSION OF BUS TRANSIT FLEET BY 100%
EXPANSION OF BUS TRANSIT FLEET BY 500%
NODAL INTERFACE IMPROVEMENTS
REDUCTION IN TRANSIT FARES
DIFFERENTIAL FARE POLICY FOR PEAK AND OFF-PEAK TIME PERIODS--ALTERNATIVE 1
DIFFERENTIAL FARE POLICY FOR PEAK AND OFF-PEAK TIME PERIODS--ALTERNATIVE 2
INCREASED PROMOTION AND FINANCIAL DISCOUNT FOR PRE-PAID TRANSIT PASS PROGRAMS
BUSPOOLING AND FINANCIAL ASSISTANCE FOR STARTING COSTS
USE OF SCHOOL BUSES DURING SUMMER PEAK POPULATION PERIOD AND OTHER NON-SCHOOL PERIODS
RAIL PASSENGER SERVICE IMPROVEMENTS
MANDATORY EMPLOYER/VEHICLE RATIOS
ELIMINATION OF DRIVE-IN WINDOWS
LIMITATION OF NUMBER OF MOTOR VEHICLE REGISTRATIONS BY MAXIMUM EMISSION LEVELS
LIMITATION OF NUMBER OF MOTOR VEHICLE REGISTRATIONS BY HOUSEHOLD
LIMITATION ON NUMBER OF DRIVER'S LICENSES BY AGE RESTRICTIONS
LIMITATION ON NUMBER OF DRIVER'S LICENSES BY COMPETENCE RESTRICTIONS
ONE-DAY-A-WEEK DRIVING BAN--WEEKDAY BAN
ONE-DAY-A-WEEK DRIVING BAN--WEEKEND BAN
GASOLINE RATIONING: FREE MARKET PRICING
GASOLINE RATIONING: NON-NEGOTIABLE COUPONS
GASOLINE RATIONING: NEGOTIABLE COUPONS
WEEKEND BAN ON GASOLINE SALES
INCREASED FUEL TAXES
INCREASED AUTO OWNERSHIP FEES
TAX EXEMPTIONS AND INSURANCE SUBSIDIZATION FOR VANPOOLS
CARPOOL AND VANPOOLING COST SUBSIDIES
TAX INCENTIVES FOR EMPLOYER TRANSPORTATION PROGRAMS
HIGH OCCUPANCY VEHICLE PRIORITY LANES
PARK-AND-RIDE LOTS
CARPOOLING
VANPOOLING AND VANPOOL BROKERAGE
BICYCLE IMPROVEMENTS
INCREASED TRUCK SIZE AND WEIGHT LIMITS
HIGHWAY COST ALLOCATION
TRUCK RATE AND SERVICE DEREGULATION
TRUCK EMISSIONS STANDARDS
LIGHT DENSITY RAIL LINE ABANDONMENT
RAIL INTERMODAL TRANSPORTATION
INTERCITY RAIL RATE DEREGULATION
CONSOLIDATION OF URBAN GOODS TERMINALS AND OPERATIONS
MARKETING, PROMOTION, AND PUBLIC INFORMATION PROGRAMS
TRAFFIC SIGNAL SYSTEM IMPROVEMENTS
TWO-DAY-A-WEEK RETAIL CLOSING
TRAVEL IMPACTS
EMISSIONS IMPACTS
OTHER SIGNIFICANT IMPACTS
COSTS-INITIAL
-CONTINUING
REVENUE EFFECTS
IMPACTS ON ECONOMIC DEVELOPMENT
BUSINESS & PUBLIC ACCEPTABILITY
IMPLEMENTATION ISSUES
→Increasing Magnitude→
Negative Impact:
Positive Impact:
Not Significant:
Blank

TABLE 7: Summary of Measures by Implementation Effort

	EMISSIONS REDUCTION POTENTIAL		
	LOW	MODEST	HIGH
HIGH IMPLEMENTATION EFFORT AND COST	Rail Passenger Transit Construction HOV Priority Lanes Two-Day-A-Week Retail Closing	Expansion of Bus Transit Fleet by 500%	Gasoline Rationing Weekday Driving Ban Mandatory Employee/Vehicle Ratios Significant Increase in Used Auto Ownership Fees
MODEST IMPLEMENTATION EFFORT AND COST	Expansion of Off-Peak Service Reduction in Transit Fares Buspooling Expansion of Bus Transit Fleet by 50, 100% Bicycle Improvements Increased Truck Size and Weight Limits Consolidation of Urban Goods Terminals and Operations Carpool and Vanpool Cost Subsidies Use of School Buses During Summer Peak Pollution Periods Rail Intermodal Service Elimination of Drive-in Windows Taxes to Encourage More Rapid Fleet Turnover Increase Highway Cost Allocation to Trucking Intrastate Truck Service and Rate Deregulation	Limitation on Motor Vehicle Registrations Weekend Ban on Gas Sales Limitation on Number of Driver's Licenses Sunday Driving Ban Truck Emissions Standards Increased Fuel Taxes	
LOW IMPLEMENTATION EFFORT AND COST	Modal Interface Information and Scheduling Improvements Transit Pass Programs Carpooling Park-and-Ride Lots Marketing, Promotion, and Public Information Programs Tax Rebates and Exemptions for Vanpooling Tax Incentives for Employer Transportation Programs	Vanpooling and Vanpool Brokerage Areawide Traffic Control System Improvements	

TABLE 7: Summary of Measures by Implementation Effort

TABLE 8: Summary of Measures by Public and Business Acceptability

	EMISSIONS REDUCTION POTENTIAL		
	LOW	MODEST	HIGH
GENERALLY UNPOPULAR	Two-Day-A-Week Retail Closing	Limitation on Number of Motor Vehicle Registrations Sunday Driving Ban Weekend Ban of Gasoline Sales Truck Emissions Standards Increased Fuel Taxes	Mandatory Employee/Vehicle Ratios Weekday Driving Ban Gasoline Rationing Significant Increase in Used Auto Ownership Fees
ACCEPTABLE TO SOME	Reduction in Transit Fares Differential Fare Policy for Peak and Off-Peak Time Periods Elimination of Drive-in Windows Moderate Increase in Used Auto Ownership Fees Increased Truck Size and Weight Limits Increased Highway Cost Allocation to Trucks Truck Rate and Service Deregulation Rail Intermodal Transportation Consolidation of Urban Goods Terminals and Operations HOV Priority Lanes Use of School Buses During Summer Peak Pollution Periods	Limitation on Number of Drivers Licenses	
GENERALLY ACCEPTABLE	Expansion of Off-Peak Service Expansion of Bus Transit Fleet by 50, 100% Modal Interface Improvements Increased Promotion of Transit Pass Programs Buspooling and Financial Assistance for Starting Costs Tax Exemptions and Insurance Subsidization for Vanpools Carpool and Vanpool Cost Subsidies Tax Incentives for Employer Transportation Programs Park-and-Ride Lots Bicycle Improvements Prevention of Light-Density Rail Line Abandonment Intercity Rail Line Deregulation Marketing, Promotion, and Public Information Programs Rail Passenger Improvements Carpooling	Vanpooling and Vanpool Brokerage Traffic Signal System Improvements Expansion of Bus Transit Fleet by 500%	

TABLE 8: Summary of Measures by Public and Business Acceptability

TABLE 9: Summary of Measures by Potential Impact on Economic Development

	EMISSIONS REDUCTION POTENTIAL		
	LOW	MODEST	HIGH
NEGATIVE IMPACT ON ECONOMIC DEVELOPMENT	Increased Highway Cost Allocation to Trucks Two-Day-A-Week Retail Closing	Limitation on Number of Motor Vehicle Registrations Sunday Driving Ban Weekend Ban on Gasoline Sales Increased Fuel Taxes Truck Emissions Standards	Mandatory Employee/Vehicle Ratios Weekday Driving Ban Gasoline Rationing
NO SIGNIFICANT IMPACTS ON ECONOMIC DEVELOPMENT	Expansion of Bus Fleet by 50 or 100% Expansion of Off-Peak Transit Service Modal Interface Improvements Differential Fare Policy for Peak and Off-Peak Reduction in Transit Fares Use of School Buses During Summer Peak Pollution Periods Elimination of Drive-in Windows Bicycle Improvements Intercity Rail Rate Deregulation Moderate Increase in Used Auto Ownership Fees	Limitation of Number of Drivers Licenses Traffic Signal System Improvements	Significant Increase in Used Auto Ownership Fees
POSITIVE IMPACTS ON ECONOMIC DEVELOPMENT	HOV Priority Lanes Rail Passenger Improvements Marketing, Promotion, and Public Information Programs Increased Promotion for Transit Pass Programs Buspooling and Financial Assistance for Starting Costs Tax Exemptions and Insurance Subsidization for Vanpools Carpool and Vanpool Cost Subsidies Tax Incentives for Employer Transportation Programs Park-and-Ride Lots Increased Truck Size and Weight Limits Truck Rate and Service Deregulation Prevention of Light-Density Rail Line Abandonment Rail Intermodal Transportation Consolidation of Urban Goods Terminals and Operations Carpooling	Expansion of Bus Fleet by 500% Vanpooling and Vanpool Brokerage	

available measures by public and business acceptability. Table 9 catergorizes the measures by their potential impact on statewide economic development. One conclusion which is apparent from examining these tables is that a 10 percent emissions reduction is possible to achieve; but only with a corresponding high implementation effort and cost, and one that is likely to generate a high level of political controversy. A second observation is that there are no measures which are both easy to implement and will yield potentially large emissions reductions.

While these general conclusions are useful, it is also helpful to summarize the individual measures by major policy area:

- Transit service improvements in the form of bus fleet expansions are expensive and contribute in only a modest way to emissions reductions. The ability to purchase large amounts of new equipment will likely preclude expansion by 500 percent.

- Reductions in transit fare schedules are unlikely to occur given the recent fare increase, and would not in any case contribute more than a small impact. The most desirable transit fare measures involves the increased promotion and financial discounts for pre-paid monthly transit passes.

- Buspooling and the alternative use of school buses both duplicate other means of transportation. In most cases, vanpooling is more cost-effective than buspooling, and normal transit vehicles are preferable to the use of school buses.

- The construction of new rail passenger service improvements cannot serve as a complete substitute for highway improvements. Further, rail transit is potentially feasible only in the Hartford area (in addition to New York City service), will contribute in only a very small way to statewide emissions reductions and will require a substantial cost.

- Regulatory measures can effectively contribute to emissions reductions largely because they directly or indirectly limit either the number of automobiles or the amount of travel that can take place. Effective implementation of most of these measures, however, will be extemely difficult, with some requiring either a regional or national implementation in order to be workable. Others are perceived primarily as energy contingency measures and would be difficult to implement on air quality grounds. Two regulatory measures judged to be more desirable than the others are the elimination of drive-in windows and a limitation on the number of driver's licenses.

- While Connecticut already has the nation's highest fuel taxes, further increases in the cost of owning and operating a private automobile would contribute in a meaningful way to emissions reductions. These strategies, however, could have other potentially serious adverse impacts. Other pricing mechanisms can serve to decrease the costs of carpooling and vanpooling or of using public transportation, and these are judged to be both desirable and feasible.

- High occupancy vehicle (HOV) priority lanes have the best implementation potential on I-91 North of Hartford, I-84/I-86 east of Hartford, I-84 west of Hartford, I-95 east of New Haven, I-95 west of New Haven and I-84 in Waterbury. On a statewide basis, though, the potential of HOV lanes is sufficiently restricted so that emission reductions are limited to about 0.18 percent.

- The state's commuter park-and-ride lot program has contributed to a reduction in NMHC emissions. Continuation and expansion of this program can increase the effectiveness of other state transportation air quality initiatives.

- Employer-based ridesharing programs, combined with the introduction of vanpool brokerage services, can contribute in a modest and cost-effective manner to improved statewide air quality. The majority of the benefits, however, are provided by vanpooling; carpooling, by itself, is judged to have only a limited potential.

- Bicycle improvements, though very popular with many interest groups, do not have the potential to make a large contribution to emissions reduction in Connecticut. Individual bike facility improvements and steps to improve storage and security, however, still may be desirable.

- Policies affecting the intra- and thru-state movement of goods via truck and rail have the potential to influence NMHC emissions. There are proposals to increase truck size and weight limits, and the recent national deregulation of the trucking and rail industry likely will lead to requests for corresponding state deregulation. Actions involving truck movements have more emissions reduction potential then rail related measures and can be combined into an overall legislative program.

- Public information, marketing and promotional programs, by themselves, have proven not to be highly effective in contributing to either emissions reductions or decreased fuel consumption. Such informational programs, however, are necessary to the smooth, effective introduction of almost all other transportation-air quality measures.

- Areawide coordinated traffic signal system improvements on the state's arterial highway system have the potential to produce 10 percent reductions in average travel times within the state's urbanized regions. The resulting emissions benefits are reduced, but not entirely offset, by induced automotive travel.

- A two-day-a-week retail closing would reverse the 1977 law allowing Sunday openings but would lead to a small emissions reduction. The vast majority of existing shopping travel would simply shift to alternate days, with also a probable geographic shift from suburban to downtown stores.

Transportation improvements seldom are implemented to accomplish only a single objective; rather a program of multiple goals and objectives generally controls the decision-making process. Especially with air quality, where the problem is neither visible nor well understood, it is important that an implementation program be based on the accomplishment of more than one high-priority state objective.

For the kinds of measures under consideration, savings in fuel consumption can be achieved as well as decreases in vehicle emissions, and these in general will be of the same general order of magnitude. For purposes of gaining public acceptance, these energy benefits may be of greater importance than the corresponding air quality improvements.

In Connecticut, as throughout New England, potential impacts on economic development will be critical in determining the reaction of both businesses and governmental units to various measures. Based upon an analysis of current population, employment, and economic trends within Connecticut, a number of the measures examined have the potential to contribute in a positive sense to the state's economic development policy. While certain measures, generally of a regulatory nature, have the potential to hurt future economic growth, it would be incorrect to conclude that all transportation-air quality measures are incompatible with the state's economic objectives. Given a careful and sensitive design, it should be possible for reasonable further progress to be accomplished in achieving the National Ambient Air Quality Standards while simultaneously promoting economic development.

Recommendations

During November and December, 1980, the results of the technical studies summarized herein and described in detail in the 15 supporting technical memoranda are being reviewed with state and local agencies, the regional planning agencies, the State Implementation Plan Revision Advisory Committee

(SIPRAC), various public and private interest groups, and members of the general public through a series of regionally-conducted workshops. Based on the results of these inputs, a specific set of recommended Phase II analyses will be developed. The following recommendations are both preliminary and initial, and are presented at this time in order to stimulate a discussion of Phase II choices and priorities. Since it is unlikely that action will be able to be taken on all possible recommendations during Phase II, priorities are assigned based on the relative magnitude of expected benefits (and negative impacts) expected to be associated with implementation.

High Priority

- Analyze packages of actions consisting of transit an/or ridesharing measures.
- Develop a more detailed assessment of the potential for areawide, coordinated traffic signal system improvements.
- Determine a target expansion level for the bus transit fleet based on air quality considerations.
- Coordinate potentially desirable statewide measures with the results of the RPA-conducted regional analyses.
- Develop and evaluate alternative pricing incentives related to increased transit and ridesharing utilization. Incorporate into alternative strategy packages.
- Include at least one strategy package which will assist in identifying the incremental effectiveness of HOV priority lanes to other measures.
- Continue with implementation of the state's new ridesharing programs.

Medium Priority

- Systematically identify and prioritize, on a statewide basis, specific corridors in which rail passenger improvements may be desirable.
- Develop a more detailed assessment of the emissions reduction potential of eliminating drive-in windows.
- Perform a more detailed analysis of procedures for limiting the number of driver's licenses.
- Investigate mechanisms of promoting vehicle fleet turnover to newer cars with lower emission rates.
- Determine a target expansion level for the state's park-and-ride lot program.
- Develop and analyze a package of truck-related measures directed at goods movement rationalization.

Low Priority

- Develop voluntary mechanisms for the adoption and utilization of employee/vehicle ratios.
- Analyze the potential for differential transit fare policies for peak and off-peak time periods.
- Evaluate alternative mechanisms for funding the up-front costs required to establish new buspools.
- Analyze the potential air quality cost-effectiveness of selected individually-proposed bicycle improvement projects.

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